A HUMAN HEALTH RISK ASSESSMENT FOR POTENTIAL EXPOSURE TO POLYCHLORINATED BIPHENYLS (PCBs) FROM SUNKEN VESSELS USED AS ARTIFICIAL REEFS (FOOD- CHAIN SCENARIO)

FINAL REPORT

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FINAL

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List of Acronyms

ADL	Arthur D. Little, Inc.
AT	averaging time
BW	body weight
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations. The CFR is published in numbered titles such as 40 CFR and numbered parts such as Part 761
COPC	Chemical of Potential Concern
CNO	Chief of Naval Operations
CRM	Certified Reference Material
CTE	Central Tendency Exposure
DQO	data quality objective
ED	exposure duration
EDL	Estimated Detection Limit
EF	exposure frequency
EPA	U.S. Environmental Protection Agency
FD	Field Duplicate
FDA	Food and Drug Administration
FI	Fraction Ingested
FR	Federal Register
FS	Finfish Sample
GC/MS	Gas Chromatography/Mass Spectrometry
HI	hazard index
HID	high-intensity discharge
HM	hazardous material
HHRA	Human Health Risk Assessment
HR-GC/HR-MS	High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry
IR	ingestion rate
IRIS	Integrated Risk Information System
JJMA	John J. McMullen Associates
LCS	Laboratory Control Sample

List of Acronyms (Continued)

LOC	Level of Chlorination
MB	Method Blank
MRL	Minimum Reporting Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAVSEA	Naval Sea Systems Command
NEHC	Navy Environmental Health Center
NOAA	National Oceanic and Atmospheric Administration
NCCOSC	Naval Command Control and Ocean Surveillance Center, a predecessor organization of Space and Naval Warfare Systems Center, San Diego (SPAWARSYSCEN)
NRC	National Research Council of the National Academy of Sciences
OEPA	Ohio Environmental Protection Agency
OPNAVINST	Chief of Naval Operations Instructions
OPPT	Office of Pollution Prevention and Toxic Substances
OPR	Ongoing Precision and Recovery
PCB	Polychlorinated Biphenyl
PDF	probability distribution function
PFK	Perfluorokerosene
ppb	parts per billion, same as microgram per kilogram (ug/Kg)
ppm	parts per million, same as milligram per kilogram (mg/Kg)
ppt	parts per trillion, same as nanogram per kilogram (ng/Kg)
PRAM	Prospective Risk Assessment Model
QA/QC	Quality Assurance/Quality Control
%R	Percent Recovery
RAGS	Risk Assessment Guidance for Superfund
RB	rinsate blank, i.e., equipment rinsate sample
RBC	risk-based concentration
RfD	reference dose
RME	reasonable maximum exposure
%RPD	Relative Percent Difference
RRF	Relative Response Factor
RRT	Relative Retention Time

List of Acronyms (Continued)

%RSD	Percent Relative Standard Deviation
SAQAPjP	Sampling, Analysis, and Quality Assurance Project Plan
SCEM	Site Conceptual Exposure Model
SCDNR	South Carolina Department of Natural Resources
SCREENEX	Screening Exercise, comprising of a screening ecological evaluation described in the SSC-SD work plan (March 23, 2000) and the detailed human health risk assessment presented in this report (NEHC, May 2000)
SF	slope factor
SICPS	Selected Ion Current Profiles
SINKEX	Sunken Vessel Exercise, same as the Navy's deep water sinking program
S/N	Signal to Noise Ratio
SOP	Standard Operating Procedure
SOW	scope of work
SRM	Standard Reference Material
SSC-SD	Space and Naval Warfare Systems Command. For this document, it is an acronym to means the Space and Naval Warfare Systems Center - San Diego (SPAWARSYSCEN) of the Space and Naval Warfare Systems Command (SPAWAR).
SQL	Sample Quantitation Limit, same as reporting limit or detection limit
SRM	Standard Reference Material
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TEQ	toxicity equivalency quotient
tDeCBs	total Decachlorobiphenyls
tDiCBs	total Dichlorobiphenyls
tHpCBs	total Heptachlorobiphenyls
tHxCBs	total Hexachlorobiphenyls
tMCBs	total Monochlorobiphenyls
tOCBs	total Octachlorobiphenyls
tPCBs	total Polychlorobiphenyls
tPeCBs	total Pentachlorobiphenyls
TSCA	Toxic Substances Control Act
tTeCBs	total Tetrachlorobiphenyls
tTriCBs	total Trichlorobiphenyls

List of Acronyms (Continued)

TUBE	Theoretical Upper-bound Exposure
TWG	Technical Working Group
USC	United States Code
UCL	upper confidence limit
UTL	upper tolerance limit
WHO	World Health Organization

Interest has been expressed by several coastal states in acquiring decommissioned U.S. Navy vessels for use in building artificial reefs. The benefits of building offshore reefs with former Naval vessels (REEFEX) include enhancing ecological resources by increasing the amount of productive hard-bottom habitat, using artificial reefs as marine protected and conservation areas, or using artificial reefs to provide alternative reefs for enhanced recreational fishing and diving opportunities to help protect and conserve natural hard-bottom reef communities. The use of decommissioned ships for these reefs also would help the U.S. Navy reduce the overhead costs of placing these vessels in storage.

Decommissioning Navy vessels includes the removal of bulk polychlorinated biphenyl (PCB) liquids and equipment (such as electrical transformers, capacitors, and other gear). After decommissioning, the vessels may contain PCB-containing components such as felt gaskets, rubber mounts, electrical cable insulation, heat resistant paints, mastic/sealants, small rubber parts, and adhesive tape. The cost of removal of these components is prohibitively high due to the extensive integration of these components into the structure of the vessels. To ensure that it is safe to sink Navy vessels to create artificial reefs, the potential risk to the environment and human health from sunken Navy vessels was investigated.

Under the auspices of the Technical Working Group (TWG), consisting of representatives from the U.S. Environmental Protection Agency (EPA) and Navy, the Navy collected and analyzed fish from a previously established artificial (target) reef and a nearby natural reference reef. The target reef is the site of the sunken ex-VERMILLION, located approximately 35 km offshore of Myrtle Beach, South Carolina. The reference reef is the Northern Area Natural Reef, located approximately 4 km southwest of the ex-VERMILLION site. Fish collection, sampling, analyses, data validation, and performance of the risk assessment were in accordance with the draft *Human Health Risk Assessment Work Plan for Potential Exposure to Polychlorinated Biphenyls (PCBs) from Sunken Vessels Used as Artificial Reefs (Food-chain Scenario)* (NEHC 2000b and 2000e) (work plan).

A draft human health risk assessment (HHRA) (NEHC 2002) was prepared and submitted to EPA in July 2002. The draft HHRA presented the results for the ingestion of three species of edible fish caught at these reefs. Comments were received from EPA in October 2002 (EPA 2002 and Versar 2002). To respond to EPA comments, the Navy conducted a fish consumption survey with the assistance from the South Carolina Department of Natural Resources (SCDNR). The survey was used to determine the amount of fish consumed from the target reef and values for the fraction ingested (FI) term, using statistical means (NEHC 2003a) to support the FI value of 0.1 assumed in the draft HHRA. Subsequent comments from EPA (EPA 2003a and 2003b, and Versar 2003a and 2003b) and the Navy response to the EPA comments (NEHC 2003b and 2003e) and Appendix J (NEHC 2003c and 2003d) led to the approach used to finalize the draft HHRA. This final HHRA addressed the above EPA comments, including the comments on the FI term, in accordance with the Navy responses (NEHC 2003b and 2003e) presented in Appendices H and I.

White Grunt (*Haemulon plumieri*), Black Sea Bass (*Centropristis striata*) and Vermilion Snapper (*Rhomboplites aurorubens*) were the three species of fish collected from both locations. All fish samples were collected and analyzed during two sampling rounds in 2000.

Twenty White Grunt, twenty Vermilion Snapper and eleven Black Sea Bass were collected from the target reef. Twenty White Grunt, twenty Vermilion Snapper and twenty-two Black Sea Bass

were collected from the reference reef. All of the fish collected are mid to upper trophic level, demersal species, typically resident on or around a given reef site. The fish species collected are considered to be valued, edible fish by sports fishermen. These fish species were chosen for PCB analysis because they represent fish that recreational anglers are likely to catch and eat. Because of their feeding habits and strong site fidelity, these reef-fish species should also show high accumulation of PCBs from a food-web effect associated with a given reef location. Each fish sample was analyzed for total PCB, total PCB concentration in each of the 10 homologue groups (levels of chlorination, i.e., mono-chlorinated through deca-chlorinated), 13 dioxin-like PCB congeners, and 18 additional, potentially environmentally relevant PCB congeners. For each fish tissue sample analyzed, the homologue, total PCB and dioxin-like PCB congener analytical results were used in the HHRA. The 18 additional, environmentally relevant PCB congeners are to be used for the ecological risk assessment, which is not part of this HHRA report. Specifically, the following PCB constituents were analyzed and used in the HHRA:

- Total PCB
- Total Monochlorobiphenyls
- Total Dichlorobiphenyls
- Total Trichlorobiphenyls
- Total Tetrachlorobiphenyls
- Total Pentachlorobiphenyls
- Total Hexachlorobiphenyls
- Total Heptachlorobiphenyls
- Total Octachlorobiphenyls
- Total Nonachlorobiphenyls
- Total Decachlorobiphenyl (PCB Congener No. 209)
- 3,3’,4,4’-Tetrachlorobiphenyl (PCB Congener No. 77)
- 2,3,3’,4,4’-Pentachlorobiphenyl (PCB Congener No. 105)
- 2,3,4,4’,5-Pentachlorobiphenyl (PCB Congener No. 114)
- 2,3’,4,4’,5-Pentachlorobiphenyl (PCB Congener No. 118)
- 2’,3,4,4’,5-Pentachlorobiphenyl (PCB Congener No. 123)
- 3,3’,4,4’,5-Pentachlorobiphenyl (PCB Congener No. 126)
- 2,3,3’,4,4’,5-Hexachlorobiphenyl (PCB Congener No. 156)
- 2,3,3’,4,4’,5’-Hexachlorobiphenyl (PCB Congener No. 157)
- 2,3’,4,4’,5,5’-Hexachlorobiphenyl (PCB Congener No. 167)
- 3,3’,4,4’,5,5’-Hexachlorobiphenyl (PCB Congener No. 169)
- 2,2’,3,3’,4,4’,5-Heptachlorobiphenyl (PCB Congener No. 170)

- 2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB Congener No. 180)
- 2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB Congener No. 189)

Additionally, each of the fish tissue samples was analyzed for moisture and percent lipid content. The data validation report that presents the analytical results for the HHRA is presented in "*Data Validation Report for Polychlorinated Biphenyl Analyses for Fish Tissue Samples Collected for a Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls from Sunken Vessels Used as Artificial Reefs (Food-Chain Scenario*)". See Appendix D of this report.

Data validation showed that the PCB data from the fish analyses met the data quality objectives and were of acceptable quality for the risk assessment. The 95% Upper Tolerance Limits (UTL) for each PCB analyte from the reference reef were derived using K-statistics. The UTLs were compared to the maximum detected concentration for the same analyte at the target reef. The comparison showed that most of the maximum detected concentrations at the target reef were above their respective UTLs. This was confirmed by the results of a Wilcoxon Rank test to determine whether significant differences in PCB concentrations at the 95% confidence level existed between fish caught at the two reefs. The results showed that there were significant differences in some PCB constituent concentrations for all fish species. The differences were most notable in the White Grunt.

Carcinogenic risks and non-carcinogenic hazards were estimated in the HHRA. The estimated values were compared to a target risk range of $1x10^{-6}$ to $1x10^{-4}$ for carcinogens, and a target hazard index of 1.0, values considered by EPA to indicate acceptable risks and hazards. The 95% UCL (reasonable maximum exposure [RME]) and arithmetic mean (average or central tendency exposure [CTE]) PCB concentrations for each fish species were used as exposure point concentrations to deterministically assess the fish ingestion exposure pathway in the HHRA. The RME risks and hazards are considered high-end risks and hazards since the 95% UCLs and conservative exposure assumptions were used. The average risks and hazards represent central tendency risks and hazards since the average (arithmetic mean) PCB concentrations and average input values for the exposure parameters were used. According to the HHRA work plan, the primary input for risk management decision making were the risk and hazard calculated deterministically based on total PCB, i.e., the risk or hazard is the summation of risks or hazards from the PCB homologue groups. The toxicity values used were the slope factors and reference dose provided in the Integrated Risk Information System (IRIS) and the total toxicity factor provided by the Office of Pollution Prevention and Toxics (OPPT). The total toxicity factor is a slope factor that is designed to provide a risk estimate that is protective of both the cancer and non-cancer effects of PCBs. In addition, the entire spectrum of potential risk and hazard was also determined probabilistically using the technique of Monte Carlo simulations. The average and probabilistic risks and hazards were used to support the assessment of uncertainty in the HHRA. To further assess uncertainties, risks and hazards were estimated for 13 dioxin-like PCBs based on the carcinogenic potencies of these congeners relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Table 1-1 summarizes risks and hazards estimated by the above approaches.

Based on a review of the FI derivation information presented in Appendix J, EPA recommended that, for the deterministic health risk assessment, FI terms of 0.14 should be used for the CTE and 0.11 for the RME assessment (Versar, October 7, 2003). In addition, EPA cautioned that the

FI term might need to be modified on a site-by-site basis if additional artificial reefs were to be evaluated. The Navy agrees with the EPA's comment on the potential uncertainty associated with the FI term. In this final HHRA, the impact on risks and hazards from the uncertainty associated with the FI term is characterized by also presenting the fish ingestion risks and hazards based on the FI term of 0.14 (CTE) and 0.11 (RME). The risks and hazards, based on the FI term of 0.l used in the draft HHRA, are also presented.

Comparison of the risks and hazards using the FI term of 0.1 (assumed in the draft HHRA for both CTE and RME) and the FI term of 0.14 (CTE) and 0.11 (RME) is presented in Tables 5-4 through 5-9. Table 1-1 summarizes risks and hazards of the July 2002 HHRA (NEHC 2002) and Table 1-2 summarizes the deterministic risks and hazards based on EPA recommended FI values (Versar 2003b). Based on results presented in Tables 5-4 through 5-9, it can be concluded that the impact is relatively small for using an FI Term of 0.1 for both the RME and CTE evaluations (NEHC 2002) vs. the values of 0.14 for CTE and 0.11 for RME in this final HHRA. The angler survey data (Hammond et. al. 2003) support the FI Term of 0.1 used in the draft HHRA; minor difference between the various values would not have any impact on the conclusions of the HHRA. That is, whichever FI values were used, the HHRA demonstrated no unacceptable risk or hazard.

The deterministic RME risk evaluation showed that the cancer risks from the consumption of White Grunt, Vermilion Snapper and Black Sea Bass from the target reef did not exceed 1×10^{-4} based on total PCBs, summation of homologue groups or the 13 dioxin-like congeners using the various toxicity factors as described previously. The deterministic RME risk evaluation also showed that the non-carcinogenic hazard indices from the consumption of White Grunt, Vermilion Snapper and Black Sea Bass from the target reef did not exceed 1.0.

The probabilistic risk evaluation confirmed the results of the deterministic evaluation. Cancer risks at the 95th percentile of the risk distribution from the consumption of White Grunt, Vermilion Snapper and Black Sea Bass from the target reef did not exceed 1×10^{-4} based on total PCBs using the IRIS slope factors and OPPT total toxicity factor. The probabilistic RME risk evaluation also showed that the 95th percentile of the distribution of non-carcinogenic hazard indices from the consumption of White Grunt, Vermilion Snapper and Black Sea Bass from the target reef did not exceed 1.0.

The calculations of probabilistic risks and hazards were in accordance with the same risk and hazard equations for the deterministic evaluation. The input range of exposure point concentrations was estimated by fitting the reported concentrations using the average concentration and standard deviation as fitting parameters. The parameters and their input values (mean, 95th percentile, and distribution), specified in the work plan, were used in determining the input variables for the probabilistic risk evaluation. Ten thousand (10,000 trials) were performed using the Monte Carlo simulations to propagate risks and hazards.

In conclusion, while the chemical data showed that the PCBs in fish caught at the target reef were, in general, statistically higher than the reference reef, particularly for the White Grunt, there were no exceedances of EPA's acceptable risk level of 1×10^{-4} or hazard level of 1.0 for any of the three fish species at the target reef.

2.1 OVERVIEW

Inactive U.S. Navy vessels would make excellent artificial reefs in U.S. coastal waters if preliminary data, suggesting that they do not pose a threat to human health or the environment from polychlorinated biphenyl (PCB) contamination, can be confirmed. A study conducted by the South Carolina Department of Natural Resources (SCDNR) provided such preliminary data. In that preliminary study, PCB levels detected in aquatic species at or nearby artificial reefs off the coast of South Carolina did not exceed the Food and Drug Administration's (FDA) action level of 2 parts per million (ppm) (Martore et al. 1998).

States, such as South Carolina, have expressed interest in acquiring inactive Navy vessels for use as artificial reefs. To confirm the SCDNR/SSC-SD study, the Navy prepared and presented a draft health risk assessment (HHRA) work plan (NEHC 2000b and 2000e) to the U.S. Environmental Protection Agency (EPA). The work plan described how the Navy would determine PCB associated risks for consumption of edible finfish species from a previously established sunken vessel artificial (target) reef and a reference (natural) reef. This report presents the results of deterministic and probabilistic risk assessments based on validated PCB data in fish using the technical approach presented in the work plan.

2.2 SUNKEN VESSELS AND PCBS

Part 761, Title 40 in the Code of Federal Regulations (40 CFR 761) was promulgated by the U.S. Environmental Protection Agency (EPA or agency) under the statutory authority of Section 6 of the Toxic Substance Control Act (TSCA) (15 USC 2601). The regulations provide stringent regulatory control on the manufacturing, processing, distribution, and use of PCBs at or above 50 parts per million (ppm). Because of their bioaccumulative property and toxic effects on humans and environmental receptors, PCBs have been banned from manufacturing since 1978. The processing, distribution, and use of PCBs also have been severely restricted by the EPA since that time. To document the health concerns, EPA published the final draft Drinking Water Quality Criteria Document for PCBs in 1986 that described the potential carcinogenic and noncarcinogenic effects of PCBs in various mammalian species, including humans (EPA, November 1986). The carcinogenic effects of PCBs in humans were reviewed, documented in a peer review workshop report, and subsequently published in a document that presented findings of the cancer dose-response assessment and its application on PCB mixtures in the environment (EPA 1996).

EPA has stated that ex-Navy vessels used for artificial reefs would be regulated as a PCB bulk product waste disposal under 40 CFR 761. Ex-Navy vessels contain PCB bulk products as integral parts of the vessels. These products include PCB-containing non-liquid materials such as felt gaskets, rubber mounts, electrical cable insulation, heat resistant paints, mastics/sealants, small rubber parts, and adhesive tape. Some of these components contain hundreds to thousands parts per million (ppm) of PCBs. For example, it was estimated that 12 to 80 pounds of PCBs could be present in the deepwater sunken destroyer, ex-AGERHOLM (DD 826) (SSC-SD 1999a). EPA is concerned that residual PCBs on board of the ex-Navy vessels, if sunken and used to build artificial reefs, may pose a risk to human health and the environment.

2.3 NAVY ORGANIZATIONS

The Naval Sea Systems Command (NAVSEA), charged with the responsibility of storage, transfer for sale/donation, scrapping, or disposal of decommissioned vessels, provides resources to scope and analyze environmental problems or issues, and recommends solutions to the Chief of Naval Operations (CNO). CNO has the responsibility of advising and executing decisions made jointly by the Assistant Secretary of the Navy for Installations and Environment, and the U.S. Environmental Protection Agency (EPA).

NAVSEA has designated SSC-SD as the overall project manager to lead the effort to address the health and environmental impacts of PCBs from sunken Navy vessels. Part of the effort was the formation a Technical Working Group (TWG), consisting of representatives from the EPA, CNO, NAVSEA, SSC-SD, and Navy Environmental Health Center (NEHC) to guide the Navy in their ship sinking program to evaluate human health and environmental risks. To assess the impact from sinking ex-Navy vessels to create artificial reefs, SSC-SD established the REEFEX program that includes performance of 1) a leaching study of PCB-containing materials found on ex-Navy Ships, 2) an ecological screening assessment, and 3) a human health risk assessment.

NEHC, the Navy Surgeon General's center for technical expertise on occupational health and environmental health sciences, is responsible for defining data needs and assessing the human health concern in support of the above SSC-SD projects. In addition, NEHC has examined human health impacts from PCB-containing materials under the continuing use (occupational) scenario. The NEHC study showed that the level of risk was acceptable for potential exposure to shipboard PCB-containing materials in the performance of repair and decommissioning activities by active duty crew and shipyard workers (Larcom et al. 1997). NEHC has also completing a human health risk assessment using PCB data in aquatic species collected under the SINKEX sampling program. This report represents NEHC's effort to assess human health risks in accordance with the draft risk assessment work plan (NEHC 2000b and 2000e) to address the EPA concern on the sinking of ex-Navy vessels in shallow water to build artificial reefs. Figure 1-1 presents the project organization chart for the latter effort.

2.4 TECHNICAL WORKING GROUP

Regarding concerns about the potential release of PCBs from ex-Navy vessels containing PCB bulk products, the Navy has been providing periodic briefings to the TWG since early 1999. The TWG has reviewed data from the following relevant studies:

- a release/fate study of PCBs in the deep ocean environment (NCCOSC 1994);
- data collected from the SINKEX study of the ex-AGERHOLM (SSC-SD 1999b);
- a SCDNR study of sunken vessels used to construct artificial reefs along the coast of South Carolina (Martore et al. 1998);
- a proposal to study the leach rate of PCB-containing shipboard materials (George 1998);
- representative data of PCB-containing material present on Navy Ships (John J. McMullen Associates [JJMA] 1999);

- a proposal to conduct "A Screening-level Risk Evaluation of the Ecological and Human Health Risk of Using Former Naval Vessels to Construct Artificial Reefs on the Continental Shelf of the United States" (SCREENEX) (SSC-SD 1999c);
- Draft Appendix A - Sampling, Analysis, and Quality Assurance Project Plan (SAQAPjP) (NEHC 2000a) for collection of fish samples in support of an HHRA for potential exposure to PCBs from sunken-vessel artificial reefs;
- Draft HHRA work plan (NEHC 2000b and 2000e) for potential exposure to PCBs from sunken vessels used as artificial reefs;
- A preliminary draft Prospective Risk Assessment Model (PRAM) version 1.1 (NEHC 2000c) and version 1.2 (NEHC 2000d) [1];
- A draft HHRA (NEHC 2002) that characterized carcinogenic risks and hazards deterministically and probabilistically in accordance with the draft HHRA work plan; deterministic risks and hazards were calculated based on an assumed FI value of 0.1; and
- Derivation of the FI term for use in the HHRA based on marine angler survey data from the ex-VERMILLION Reef (NEHC 2003a) and its revision (NEHC 2003c and NEHC 2003d).

2.5 RISK-BASED DISPOSAL APPROVAL

The amount of PCB-containing bulk product materials that can be left on a vessel (cleanup level) in the reef-building program has not been determined. It is understood that the EPA will be responsible for evaluating available information and making recommendations on this issue. It is likely that the cleanup level will be dependent on the potential risk to human health and the environment, technical feasibility, cost of cleanup, and cleanup thresholds that would be acceptable to regulatory agencies and the concerned public.

EPA representatives in the TWG indicated that the sinking might release PCBs into the aquatic environment over a period of time. As such, the impacts of such releases on human health and the environment should be addressed and documented through the use of a risk assessment (Comment made by John Smith, EPA during the March 17, 1999 TWG meeting). This is evidenced by the EPA's amendment to the PCB Rule dated June 29, 1998 (63 FR 35383) that allowed the risk-based disposal approval option to the management of PCB bulk-product wastes under 40 CFR 761.62(c). Further, it is understood that EPA had used risk assessment to evaluate an application for regulatory approval for the sinking of the ex-SPIEGEL GROVE to create an artificial reef in the Florida Keys. Therefore, the Navy concluded that risk assessment is a reasonable tool to provide information for assessing the potential impacts from creating artificial reefs with ex-Navy vessels. This information will be essential for EPA in making a decision on the use of sunken vessels to build artificial reefs under 40 CFR 761.62(c).

On January 12, 2000, the Fibers and Organic Branch in the Office of Pollution Prevention and Toxics (OPPT) issued an interim draft guidance (EPA 2000), entitled, "*PCB Risk Assessment Review Guidance Document*" (EPA 2000) to ensure completeness of reviews of risk assessments

[1] PRAM is being developed to estimate PCB levels in aquatic species living on or near artificial reefs, and to calculate potential human health risks based on known leach rates and the estimated amount of PCBs remaining on board vessels when they are sunk.

submitted by the regulated communities pursuant to 40 CFR 761.62(c). The Navy has consulted with the above guidance document in preparing this HHRA report.

2.6 CONTENTS OF THIS RISK ASSESSMENT REPORT

The report presents the following information:

- Section 1.0 is the executive summary that presents an overview of the project, risk assessment results, and recommendations. This section also presents Tables 1-1 and 1-2 that summarize risks and hazards calculated from the probabilistic and deterministic risk assessment approaches, and Table 1-3 that highlights revisions made in the draft HHRA in order to finalize the HHRA;
- Section 2.0 provides background information and explains the need for risk-based evaluation to assess impacts from the use of ex-Navy vessels to create artificial reefs;
- Section 3.0 presents the project objective for SCREENEX under the Navy's REEFEX program, the risk management questions, and specific objectives for the HHRA;
- Section 4.0 presents the data acquisition process, including the sampling strategy, a summary of the fish collection efforts conducted in 2000, and the data validation approach and results;
- Section 5.0 presents the HHRA findings, identifying PCBs as the chemical of potential concern (COPC) and the fish ingestion as the complete exposure pathway, and providing input values for the exposure assessment (including the derivation of exposure point concentrations), toxicity values for risk characterization, and the risk characterization methodology, findings and uncertainties (including the FI term and limitations for drawing conclusions for risks and hazards for other or future artificial reefs), and recommendations. This section also presents deterministic risks and hazards based on EPA recommended FI term values of 0.11 (RME) and 0.14 (CTE), and the assumed FI term value of 0.1 used in the draft HHRA;
- Section 6.0 provides references for citations presented in this report.

Figures, tables, and appendices follow the text covering all sections. Comments on this risk assessment should be directed to:

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3.1 PROJECT OBJECTIVES

Under the REEFEX program, the Navy initiated a project known as SCREENEX to evaluate ecological and human health risks associated with the use of former Naval vessels to construct artificial reefs on the continental shelf of the United States (SSC-SD, December 1999c). The EPA has reviewed and provided written comments on the project proposal and the Navy has responded to the EPA comments.

Pursuant to the SCREENEX project, NEHC prepared the draft HHRA work plan entitled, "*A Human Health Risk Assessment Work Plan for Potential Exposure to Polychlorinated Biphenyls from Sunken Vessels Used as Artificial Reefs*" (NEHC 2000b and 2000e). The work plan proposes the methodology to conduct a detailed evaluation of human health risks under the baseline scenario. Through the TWG, EPA has reviewed and commented on the HHRA work plan (EPA 2001a and 2001b, and Versar 2001 and 2002). This HHRA report follows the approach presented in the work plan and the Navy responses to the EPA comments (Appendix A).

The project objective of SCREENEX is to develop a consensus within a joint Navy/EPA TWG regarding the decision criteria that must be satisfied to evaluate risk to human health and the environment associated with PCBs and the sinking of ex-Navy hulks. Specifically, the findings of SCREENEX will help define the future course of action, e.g., further data collection needs, if required. The risk assessment will put into action a process that will enable risk management decisions to be made by the EPA and Navy regarding beneficial use of decommissioned Navy vessels for reef building projects. The risk management questions that need to be addressed are:

- *Is it likely that the sinking of former Navy vessels containing PCB-containing materials will pose an unacceptable risk to human health or the environment?*
- *How much PCB residue can remain on former Navy vessels used for building artificial reefs without resulting in an unacceptable risk?*

It is anticipated that EPA and the Navy will address the above risk management questions by considering the results and the associated uncertainties from the human health and ecological risk assessments, and other input into risk management decision making (such as cost, technical feasibility or practicability, societal benefits, public or community acceptance, regulatory compliance, etc.) The relationship between risk assessment and risk management is depicted in Figure 3-1 according to EPA (1989b).

3.2 OBJECTIVES OF THIS RISK ASSESSMENT REPORT

The primary objective of this risk assessment report is to provide human health risk input and the associated uncertainty to the Navy and EPA for making risk management decisions. As such, the risk input encompasses various risk descriptors for the exposure pathway of concern. These descriptors include deterministic carcinogenic risk and non-carcinogenic hazards under the reasonable maximum exposure [RME] and average exposure scenarios and probabilistic carcinogenic risk and non-carcinogenic hazards at the 95th percentile (RME) of the risk distribution and at the 50th percentile (average) of the risk distribution. The carcinogenic risk and non-carcinogenic hazards were evaluated both separately and combined per EPA (2000).

It has been the Navy's experience that the risk assessment process is a reiterative process that provides risk information sufficient for risk management decision-making. The risk information consists of risk estimates and the associated uncertainties that are affected by the data, assumptions, and methodology employed. Early dialogue with the EPA on the risk assessment approach and interpretations of the risk assessment results and uncertainties via the work plan development process had provided the opportunity to address concerns expressed by the EPA representatives at the TWG. In support of the human health component of SCREENEX, the objectives of this report are:

- To communicate to the agency and other stakeholders regarding the technical approach, algorithms, data input, risks and uncertainties for the exposure pathway of concern (fish ingestion by recreational anglers);
- To identify the strength and limitations of the HHRA; and
- To recommend options for risk management based on the risk assessment results and uncertainties.

Efforts were undertaken to make the risk assessment results more transparent and understandable to ensure that the Navy and EPA will make reasonable, yet realistic risk management decisions. They were accomplished by the presentation of various risk descriptors and assessment of uncertainties. The Navy acknowledges that this baseline HHRA is only one of the several inputs for making risk management decisions. Other inputs include the screening ecological risk assessment or evaluation, cost, technical feasibility, compliance, schedule, environmental liability, societal benefits, and community acceptance, etc. However, where the risks and environmental impacts are acceptable, there should not be a basis for further action as it relates to the issue of PCBs leaching from these ships using the exposure scenario defined in this document.

4.1 DATA QUALITY OBJECTIVES

The data quality objectives (DQO) process (EPA 1993), including the presentation of key steps to establish DQOs, has been fully described in the draft HHRA work plan and its appendices (SAQAPjP). This section provides a summary of the key elements for the DQOs for fish data collected in support of the HHRA.

Statement of the Problem:

Residual PCBs in sunken Navy vessels used for creating artificial reefs may contaminate the marine environment and subsequently impact fish that are caught and eaten by recreational fishers or anglers. PCBs are known to be highly bioaccumulative in fish, and have been shown to cause cancer in experimental animals and various non-cancer effects in animals and humans (reproductive, immunotoxic, chloracne, etc.).

Risk Management Decision:

The key decision is whether or not decommissioned Navy vessels should be sunk to create artificial reefs. Risk management is the selection of remedial alternatives based on consideration of risk and uncertainties, and other input criteria.

The risk assessment results and other risk management considerations may support one or more of the following alternatives: (1) allow states to proceed with artificial reef building (with sunken ex-Navy vessels) without limits or restrictions relating to the onboard PCBs, (2) require the Navy to gather additional data and evaluate existing sunken vessel artificial reefs relating to the onboard PCBs, or (3) allow states to proceed with building artificial reefs with conditions relating to the onboard PCBs.

Inputs or Data Needs for Making the Decision:

Data that provide the concentrations of PCBs in recreationally caught fish are needed to estimate human health risks from the fish ingestion exposure pathway. The risk assessment findings also may be used to support additional studies specific to Navy vessels.

The investigation and the resulting risk assessment provides much useful information, including:

- Deterministic and probabilistic risks associated with consumption of fish from artificial reefs. In particular, it provides evidence to help answer the question “Do sunken vessel artificial reefs currently pose unacceptable risks to humans?”
- Whether fish tissue at artificial reefs contains higher levels of PCBs than those for fish from uncontaminated (reference or background) areas.
- The contribution of “background” to overall PCB risks. When making decisions on the advisability of sinking any Navy vessels, total (i.e., background + incremental) PCB risks have to be considered.
- Together with other risk assessment/risk management tools such as the Prospective Risk Assessment Model (PRAM) (NEHC 2000d), the HHRA should help facilitate EPA's reviews

of applications by interested states to build artificial reefs elsewhere and the determination of whether any additional studies might be required.

Decision Rule:

Various statistical methods have been used to determine if differences in fish tissue PCB concentrations exist between fish from the reference and target reefs. If there is a difference, RME and average exposure scenarios will be used to characterize risk and hazard associated with consumption of these fish. If the estimated excess lifetime carcinogenic risks are lower than 1×10^{-4} and the hazard quotients are equal to or below unity (1), and an evaluation of uncertainty concludes that the uncertainty is acceptable, there should not be a basis of concern for the fish ingestion pathway associated with the sunken vessel reef in S.C. Based on EPA's comments on the work plan (Versar 2001), it is understood that EPA has the discretion of lowering the acceptable risk and hazard level (therefore, making them more stringent), and may impose restrictions even when the risk is less than 1×10^{-4}.

If there are exceedances above the 10^{-4} (cancer risk) and the 1.0 (hazard level), there may be a basis for concern, and additional evaluation should be performed. Such evaluations may include sampling of abiotic media and additional sampling and analyses of fish and biota in the benthic and epibenthic communities to determine whether the food-web model as delineated in the Site Conceptual Exposure Model (SCEM) (Figure 5-1) is correct. Additionally, a refined approach to evaluate risks and uncertainty would be required.

Limits on Decision Errors:

Uncertainties in the data input for the estimation of carcinogenic risks and hazards are expected. Such uncertainties or data variability have been evaluated by the average risks and hazards, and findings from the probabilistic evaluation. The fish data to be collected and analyzed are definitive data, and have been reviewed and validated for quality according to requirements identified in SAQAPjP. Rejected data was not be used in the risk assessment (it is noted that there were no rejected data). Exposure factors were based on site-specific considerations and EPA's Exposure Factors Handbook (EPA 1997a). The input data, exposure factors and uncertainties used in the risk assessment were reviewed to ascertain reliability of the results.

4.2 DATA ACQUISITION

Through interagency agreement, SSC-SD solicited the assistance of the Finfish Management Section of SCDNR, Charleston, SC to collect and process fish under the direction of Mr. Mel Bell. Todd Hunt, a fish biologist at URS Corporation – Franklin, TN, was assigned by NEHC to accompany the sampling crew to observe, document, and assist in fish collecting, processing and sampling in accordance with the SAQAPjP. For PCB analyses, SSC-SD selected the analytical service of AXYS Analytical Services, Ltd. of Sidney, British Columbia, Canada (AXYS). EPA Method 1668, Revision A, a high-resolution gas chromatography/high-resolution mass spectrometry (HR-GC/HR-MS) (EPA 1999) method was used to achieve an average target reporting limit less than 0.015 ng/g (15 pg/g) per individual congener. Dr. Alan Roberts, Senior Chemist of URS, directed the data validation effort (Appendices D-1 and D-2). This section

describes the sampling strategy, data collection, and quality assurance program that has resulted in the PCB data for the HHRA.

4.2.1 Sampling Strategy

Various finfish species have been found and documented by SCDNR (Table 4-1). According to SCDNR, edible fish such as Black Sea Bass, Grouper, White Grunt, and Vermilion Snapper are some of the primary demersal species caught and consumed by recreational anglers fishing on artificial and natural reefs off South Carolina.[2] These species can be strongly territorial on and near offshore reefs, although Black Sea Bass may spend most of their early life stages associated with hard bottom substrates in estuarine and nearshore waters before migrating farther out to sea. White Grunt and Vermilion Snapper spend the majority of their life cycles closely associated with offshore hard bottom reef habitats. The choice of these target species was intended to focus the HHRA on finfish species that recreational artificial reef fishers are likely to catch and eat, and that are also likely to accumulate PCBs from the reef (i.e., resident upper trophic-level fish).

According to the HHRA work plan, Black Sea Bass, Grouper, and other valued finfish, such as the White Grunt and Vermilion Snapper were the potential fish species to be collected. The target reef was determined to be the worst-case sunken vessel artificial reef identified in the 1998 SCDNR study, the ex-VERMILLION. This reef was found by SCDNR to have some of the highest PCB levels detected in this study, with a detection limit of 100 parts per billion.[3] The reef to be used as the reference reef was determined to be the Northern Area Natural Reef, located approximately 4 km southwest of the target reef. The reference reef is a hard-bottom natural reef that is unlikely to contain PCBs, and that was not likely to be within the home range of the fish species resident to the target reef. Appendix B provides additional discussion on the characteristics and approximate locations of these reefs.

The goal of the data acquisition effort was a minimum of fifteen fish per selected species from each reef site. Although smaller numbers (e.g., 7 or 9) may have been acceptable, the numeric goal of 15 was generally recognized as an acceptable number of samples required to characterize the degree of contamination of a relatively homogenous sample population with a reasonable level of confidence and statistical power. No small specimens were to be used. All finfish needed to be above the legal size to best represent size classes that recreational fishers would be likely to take home and eat. At each reef location, both field samples (standard fish samples) and

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[2] There are two species of Grouper commonly found off the South Carolina Coast: the scamp grouper (*M. microlepis*) and gag grouper (*M. phenax*). Both species have similar life habits. Either species would have been acceptable to be used in the risk assessment; generally the scamp grouper is more abundant. It was recommended that the gag grouper be used only as a backup for scamp in the event the gag grouper turned out to be more numerous when sampling was conducted. In other words, a field decision with scamp grouper as preference, but no mixing and matching of these two different species. If other valued finfish species were encountered and caught, these species were to be used to substitute the Grouper sp. or Black Sea Bass in entirety. The valued finfish fish species included White Grunt (*Haemulon plumieri*) and Vermilion Snapper (*Rhomboplites aurorubens*), etc.

[3] In the study by SCDNR (Martore et al. 1998), which was considered preliminary, PCB data were collected from biota at former sunken vessel sites. In the Northern Region (the proposed study area), none of the biota analyzed were found to contain PCBs above the limit of quantitation (LOQ) at 100 ppb at the hard-bottom natural reef (reference reef). In contrast, the ex-VERMILLION (target reef) in this region had the highest concentration of PCBs in biota (Atlantic Winged Oyster at 235 ppb) among the seven sunken vessel reefs studied. The ex-VERMILLION was also the largest sunken vessel among the ship classes evaluated and therefore, was expected to have the highest estimated source term (mass of PCB-containing materials) of any of the vessels.

quality assurance (QA) samples were to be obtained. Consistent with the state of the practice for fish sampling, finfish were to be caught and preserved (stored on ice or frozen) and samples were not to be created and assigned sample numbers until the fillets were collected from the fish. According to the SAQAPjP, the QA samples were to consist of the following:

(1) Rinsate or equipment blank (RB). RB samples were to be collected at the frequency of one sample per sampling/fish processing location. If fish were processed at the SCDNR Marine Resources Research Institute's laboratory (rather than on the fishing vessel), one RB sample per fish processing event was also required for that location. A rinsate blank is created by rinsing the decontaminated fish processing equipment with triple distilled or deionized water.

(2) Field duplicate (FD)/Split samples. FD samples (intralab precision) /split samples (interlab precision) were collected for 5% or more of the total number of fish collected and processed. A FD sample for a particular finfish sample (FS) is created by filleting both sides of a fish being processed. One side will be designated as FS and the other side, as FD.

(3) Matrix spike (MS). Although MS and matrix spike duplicate analyses were not required by Method 1668, at least 5% of the fish collected and processed were designated for MS analysis. From a single finfish, one fish fillet collected was labeled as FS and the other, MS. In addition, the laboratory analyzed at least 5% of the field samples or matrix spike samples in duplicate.

Excess finfish samples not shipped to the contract laboratory (AXYS) were archived and stored (kept frozen) at the SCDNR laboratory initially and later transferred to the URS – Franklin, TN laboratory under strict custody.

4.2.2 Summary of Fish Collection Efforts

Fish collection efforts included two sampling events, and an additional visit to the target reef in an attempt to collect additional Black Sea Bass (*Centropristis striata*). No additional Black Sea Bass were collected in the last event. A total of 62 and 55 fish were collected at the reference and target reefs, respectively. Of these samples, all 62 reference reef fish and 51 of the target reef fish were used in the risk assessment (Table 4-2). The fish collected consisted of Vermilion Snapper (*Rhomboplites aurorubens*), White Grunt (*Haemulon plumieri*), and Black Sea Bass (*Centropristis striata*). Bank Sea Bass (*Centropristis ocyurus*) and sublegal-sized Gag Grouper (*Mycteroperca microlepis*) and Scamp Grouper (*Mycteroperca phenax*) were collected at the reference reef, but not retained. Whitebone Porgy (*Calamus leucosteus*) were collected at the target reef, but not retained. Two toadfish were collected at the reference reef in the first sampling event. The livers of the toadfish were removed, weighed, and archived for possible use in the ecological risk assessment. (Ecological risk assessment is not part of this report.)

The first sampling event was held between May 1 and May 4, 2000. The sampling effort was undertaken by the Finfish Management Section of SCDNR under the direction of Mr. Mel Bell. Eight SCDNR scientific crew members and Todd Hunt of URS participated in this collection activity. The sampling gear utilized included chevron traps, modified crab traps, hook and line, and spearfishing (Appendix C). Fishing was conducted onboard of R.V. Palmetto on May 2 and May 3, 2000. Mel Bell, two other SCDNR crew-members and Todd Hunt took measurements (length, weights, sex, and age) and processed the collected and retained fish and samples

onboard R.V. Palmetto. QA/QC samples (i.e., field duplicates and rinsate samples) were also collected.

During the sampling event, the SCDNR divers observed the following:

- Very few legal-sized grouper at either reef; and
- Very few Black Sea Bass at the target reef.

Experience from the first sampling event suggested that it was very unlikely that an adequate sample size or number of either species of grouper could be collected. Divers would, more than likely, have provided the best opportunity to collect large groupers. Diver's "bottom" time was limited in the 100 foot-plus water depths and therefore an enormous amount of effort would have been required to collect 15-20 legal groupers. As an alternative, it was decided that the next sampling event should concentrate on collecting Black Sea Bass from the target reef. As another possible alternative, the collection of White Grunt and Vermilion Snappers at the target reef was considered. From recreational fisheries landings reports, SCDNR had previously documented that recreational fisherman readily caught and consumed White Grunt and Vermilion Snapper. Based on their life histories, both species are known to closely associate with natural and artificial reef locations, and show strong site fidelity to these types of hard bottom habitats throughout their life cycles.

The second sampling event was held between June 12 and June 15, 2000. Like the first sampling event, the sampling effort was undertaken by SCDNR. Five SCDNR scientific crew-members and Todd Hunt participated in this collection activity. The sampling gear utilized was the same as that used in the first sampling event. Fishing was conducted onboard the R.V. Palmetto on June 13 and June 14, 2000. Mel Bell and Todd Hunt took measurements. Fish were not processed, instead, sample identification numbers were assigned and each fish was individually bagged. Samples were sorted by species, by site, and sealed into larger bags to facilitate future fish processing. Chain-of-custody forms were completed and placed in each bag. QA/QC samples were not collected since processing was not performed. Divers observed very few Black Sea Bass at the target reef location, although 10 individual Black Sea Bass were collected by spearfishing. Fish samples were kept frozen and stored at SCDNR temporarily pending the results of an additional fish collection effort. This third effort was unsuccessful in collecting additional Black Sea Bass from the target reef.

On June 27, fish from the second sampling event were removed from frozen storage and placed in coolers of wet ice to thaw. On July 31, the SCDNR team and Todd Hunt prepared the processing area at the SCDNR laboratory and reviewed fish processing procedures. On August 1 and 2, fish were processed with fillets individually wrapped and placed in a sealed bag together and frozen. QA/QC samples were collected. Tables 4-4 and 4-5 present information concerning sample identification number (ID), date collected, length, weight, sex, and estimated age (in years) for the fish collected. Due to threats of hurricanes in South Carolina and the possibility of electrical outages, SCDNR and the Navy jointly decided that the fish should be removed and shipped to the URS laboratory in Franklin, TN for storage to await shipment to the analytical laboratory. Four coolers of frozen fish fillets on wet ice were shipped by overnight express courier to the URS- Franklin, TN office under appropriate chain-of-custody procedures. The fish samples arrived frozen at URS and a Sample Custodian cross checked each sample against the chain-of-custody form and placed the samples in a freezer which was sealed with custody seals

until the samples were shipped to AXYS on September 13, 2000. Table 4-6 presents sample IDs, types, and analysis requested on the chain-of-custody form.

4.2.3 Supplemental Analytical Needs

During the initial round of sample analyses for this risk assessment, the analytical results from AXYS indicated that the White Grunt target reef sample PCB concentrations were significantly higher than those from the reference reef, both on a whole fillet basis and on a lipid-normalized basis. There also was a lipid content difference reported between the target and reference reef White Grunt samples. These results are in marked contrast to those for the Vermilion Snapper samples for which there was little, if any, increase in PCB or lipid concentrations between the reference and target reefs. While the specific reason(s) for differences in lipid content between fish from the target reef and reference reef was not investigated, it is believed that the artificial reef created by the sinking of the ex-VERMILLION creates a relatively concentrated non-mobile fishery. The surrounding area based on discussion with the SCDNR crew was described as sand flats with limited areas of shelter and habitat. Therefore, a fish associated with the ex-VERMILLION is not as likely to expend energy in pursuit of prey thus conserving their fat reserve. The reference reef was more complex and diverse and therefore fish are more likely to expend greater effort pursuing food.

After receipt of samples, the laboratory arranged their preparation batch samples such that each of the four batches consisted largely of samples from the same species and reef. This raised the question as to whether the anomalous analytical results for the White Grunt reference reef samples could possibly be a result of something that happened to that batch of samples during preparation or analysis rather than representing a true difference for the White Grunt fish found over the target reef. A detailed review of procedures and raw data and split sample results was performed to see if anything could be discovered that would suggest that the results were an artifact of the preparation or analysis procedures. As summarized in the data validation report attached as Appendix D-1, nothing was found to suggest that the results were an artifact of the procedures. The evidence strongly suggests that the reported results are not likely to be an artifact of the procedures.

However, since an initial evaluation of the White Grunt target reef results indicated an elevated level of PCBs (See Section 5.4.1) it was decided to analyze additional fish samples that had been archived from the original sampling episodes. On July 9, 2001 all of the archived fish fillet samples stored frozen under custody at the URS-Franklin, TN office, were split and shipped under custody to two separate laboratories (AXYS and the Arthur D. Little laboratory in Cambridge Massachusetts). Each sample was given a randomly selected Field Identification number so the laboratories would not know from which fish species and which reef each sample came. The archived samples included samples collected from an additional species, Black Sea Bass. At each laboratory, the samples were independently homogenized and analyzed using different analytical methods. AXYS analyzed the samples using Method 1668 procedures identical to those for the first round of analyses. Arthur D. Little used a modified Method 680 Selective Ion Monitoring Gas Chromatography/Mass Spectrometry method. It was anticipated that these supplemental analyses would either increase the confidence in the results reported from round 1 or would supply evidence that the differences were an artifact of the preparation or analysis procedures.

The analytical results from the supplemental analyses strongly supported the findings from the first round of analyses and provided conclusive support for the conclusion that observed differences between target reef and reference reef analytical results were not an artifact of the preparation or analysis procedures. Very good agreement was obtained between the results from AXYS and those from the second laboratory. This good agreement was obtained for the results from all three species of fish from both the target and reference reefs. Of prime importance is the observation that the results provided by both laboratories for the White grunt samples indicated significantly higher PCB and lipid concentrations in the fish collected over the target reef relative to those collected over the reference reef, verifying the findings from the first round White Grunt analyses. Both laboratories also had analytical results for Certified Reference Material analyses in good agreement with the certified values.

Since the supplemental analyses provided such strong support for the high quality of both the first and second round of sample analyses by Method 1668, the Human Health Risk Assessment was performed on the pooled Round 1 and Round 2 Method 1668 results.

4.3 SAMPLE ANALYSIS, REPORTING, AND VALIDATION

AXYS performed work according to the scope of work (SOW) prepared for the laboratory. The SOW prescribed the holding times, temperatures, sample preparation, analytical methods, required detection limits, internal audit and quality control measures (including instrument calibration, laboratory duplicates, procedural blank, ongoing precision and recovery, etc.), calculation of data quality indicators (precision, accuracy, and completeness), schedules, and the type of data packages required as deliverables. All samples were homogenized by the laboratory before extraction and analysis. A laboratory rinsate blank was collected for the homogenizer. In addition, the laboratory also performed analyses of the method blank and laboratory control samples (LCS). (The laboratory was provided with a standard reference material (SRM) [same as certified reference material {CRM}] that contained PCB congeners and other organics for the assessment of the laboratory's performance in sample homogenization, extraction, and analysis.) The SRM consisted of PCB congeners in mussel tissue (U.S. Commerce Department's National Institute of Standards and Technology [NIST] CRM 1974a) with 20 PCB congeners with reference concentrations that range from 0.0055 mg/kg to 0.876 mg/kg). This SRM was sent directly by the Navy's contractor (Arthur D. Little [ADL]) who served the role as the prime contractor to AXYS for analytical services in the SCREENEX project.

4.3.1 Analytical Method and Reporting Limits

The selection of the analytical method to support risk-based determination and risk assessment was considered and discussed extensively in the draft HHRA work plan. Based on guidance in RAGS (EPA 1989a), non-detected constituents are assigned a surrogate concentration value of one-half the detection limit. It should be noted that there are 209 specific PCB compounds and a single homologue group may contain one compound (deca-chlorinated) to as many as 46 compounds (penta-chlorinated isomer group). Since the non-detects and detected levels of PCBs were to be used in the risk assessment, an analytical method that could provide a lower detection limit provided a lower surrogate concentration for the non-detects and thus reduced uncertainty in the baseline risk assessment.

The project-required risk-based reporting limit for total PCBs was 3.2 µg/kg (ppb or ng/g) on a wet weight basis. This corresponds to an average reporting limit of 15 ng/kg (0.015 µg/kg) per congener such that if all 209 PCB congeners were non-detectable, the sum of one-half of the reporting limits would equal the EPA Region III RBC of 1.6 µg/kg. To meet this low detection limit, the latest update of EPA Method 1668 (Revision A), a HR-GC/HR-MS analytical method, was required of AXYS for the analyses. Because PCBs accumulate in fats, lipid analysis was performed on all samples according to Method 1668. Additionally, moisture content was determined for each sample.

4.3.2 Sample Reporting

The laboratory deliverable was a CLP-like full data package, including the laboratory's detailed QC narratives, calibration, tuning, raw data, and summary forms for all samples and QC samples. All analyses were reported on a wet-weight basis. The laboratory maintained the extra homogenates for up to 12 months before they were discarded. During this time, frozen samples were to be kept at a temperature equal to or below –10 degree Celsius.

The analytical results for the fish tissue samples were reported in two data packages with AXYS identification numbers 2767 and 3606 for the first and second rounds of analyses respectively. The date of the report for the first round of analyses was November, 2000. These samples were prepared and analyzed in four preparation batches. The date of the report for the second round of analyses was September, 2001. These samples were prepared and analyzed in three preparation batches. No field duplicate analyses were associated with the second round of analyses. The split sample analysis agreement is considered to provide adequate evaluation of the sampling and analysis precision for this round of analysis without having additional intra-laboratory field duplicate analyses performed.

AXYS provided the deliverable in hard-copy and electronic formats. NEHC created a database in Microsoft Access, into which the laboratory data were downloaded. The sample reporting forms, printed from the database, are included in the data validation report (Appendix D).

4.3.3 Summary of Data Validation Process

Per the SAQAPjP, all fish tissue sample data were validated to assess the quality of the data generated by the laboratory and the effect of any quality control indicators found outside the evaluation limits on data usability. The data validation was conducted in accordance with the provisions of the SAQAPjP which specifies EPA Region 10 guidance on the validation of Method 1668 data for the HR-GC/HR-MS analysis (EPA 1995b) and the EPA's National CLP Program's *National Functional Guidelines for Organic Data Review* (EPA 1999), as appropriate. The validation consisted of evaluating laboratory performance parameters for at least 25% of each data set (round 1 and 2) and sample-specific parameters for 100% of the data sets.

The following areas were validated in accordance with the SAQAPjP:

- Chain-of-custody forms
- Sample receipt temperatures
- Extraction documentation

- Holding times
- Instrument tuning
- Instrument calibration - initial and continuing
- Method blanks
- Internal Standard Recoveries
- Laboratory control standards
- SRMs
- MS and duplicate sample analyses
- Field duplicates
- Field blanks - rinsates
- Compound identifications
- Recalculations of response factors, sample concentrations, etc.

Laboratory performance parameters were reviewed during data validation. These parameters are those that control the analytical laboratory and thus, are indicators of the overall performance of analytical system. The laboratory performance parameters evaluated include:

- GC/MS performance checks (i.e. tuning and resolution);
- initial calibration;
- calibration verification;
- system performance (i.e. ongoing precision and recovery as indicated through the analysis of laboratory control samples and SRM);
- compound identification;
- compound quantitation; and
- verification (i.e. checking for transcription errors).

Sample-specific parameters were also evaluated during data validation. These are parameters that are influenced by sample handling procedures and the matrix of the individual sample. They include:

- case narrative comments;
- sample handling (i.e. COC procedures, sample receipt, and holding times);
- method blank results;
- rinsate blank results;
- internal standard recovery;
- matrix spike analysis;

- laboratory duplicate sample analysis; and
- field duplicate agreement.

Following the evaluation of laboratory performance criteria and sample-specific criteria, an overall assessment of the data with respect to the data quality indicators of reporting limits, accuracy, precision, completeness, representativeness, and comparability was formulated. The overall assessment is presented in Section 4.3.4.

During the data validation process, the data reviewer annotated on the analytical data sheets data validation qualifiers ("U", "J", "UJ", and "R") and associated qualifier and bias codes as listed in Table 2-1 of Appendix D. The purpose of the qualifier codes is to provide information with regard to the data quality condition(s) that resulted in the assigned qualifiers. The bias code provides an indication of the bias direction of the results qualified as estimated based on data quality condition(s) that resulted in the data qualification and the results of the other associated quality control analyses. The data qualifier codes are followed by a hyphen and the applicable bias code. For example, a result qualified as "estimated due to a holding time exceedance", which resulted in a potential low bias in the result, would have the following code annotated on the data sheet, "HT-L". In the case of multiple data quality conditions resulting in qualification, each qualifier code is listed and separated by a comma. For example, a result qualified as estimated due to low matrix spike recovery and poor method duplicate precision would have the following codes annotated on the data sheet, "MS, MD – I". The analytical results with assigned data qualifiers, qualifier codes, and bias codes are also included in Appendix D.

4.3.4 Overall Assessment

Section 4 of Appendix D-1 (first round analyses) and Section 4 of Appendix D-2 (second round analyses) present detailed findings of the data validation. Careful examination of all laboratory documentation and raw data was conducted and no errors were found in sample preparation or analysis. No systematic errors were likely during sample preparation and analysis since AXYS used a variety of laboratory personnel in preparing samples for each analytical batch.

The data validation found that some results qualified as nondetect (U) on the basis of method blank and/or rinsate blank contamination and some results were qualified as nondetect on the basis of identification criteria. In addition, a few sample results were qualified as estimated (J) on the basis of associated matrix spike recoveries, CRM results, or due to co-elution with one or more non-target PCBs.[4] A summary of QC parameters evaluated is presented below:

[4] Some of the PCB congeners could have a potential high bias in the AXYS analytical results owing to the fact that the results reported by AXYS for some of the congeners are from peaks comprised of co-eluting congeners. Upon review of the certificate of analysis for SRM 1974a, no certified value for PCB 87 was found. PCB 87 coelutes with PCBs 86, 97, 108, 119, and 125. Therefore, the reported values for PCB 87 are maximum possible concentrations. As described in the validation report (Appendix D) for the first round of analyses:

"No errors in compound quantitation were found. However, several target PCB congeners co-elute with one or more non-target PCBs. Detected results or these PCBs were qualified as estimated (J) with a potential high bias because the reported value represents the sum of the concentrations of the target PCB in addition to other co-eluting congeners. A qualifier code of EMPC(C)-H was assigned to these results, where EMPC stands for estimated maximum possible concentration and the "C" in parentheses indicates co-elution as the cause. The affected PCBs are: PCB18, PCB28, PCB44, PCB49, PCB87, PCB101, PCB128, PCB138, PCB153, PCB180 and PCB183. Of these, the only dioxin-like congener is PCB180, which co-elutes with

Sensitivity – In accordance with the method requirements, the laboratory calculated an estimated detection limit (EDL) based on a signal to noise ratio of 3:1. The level of sensitivity achieved for the individual sample analyses is considered to be acceptable. Of the 149 nondetect results for individual congeners for round 1 analyses (for which the average detection limit was 4 pg/g and the median detection limit was 0.26 pg/g), only 12 had detection limits greater than 15 pg/g. They were for PCB congener numbers 126 and 169. In each instance, the detection limits for the nondetect results accounted for less than 0.5% of the total PCB result. Of the 171 nondetect results for individual congeners for round 2 analyses (for which the average detection limit was 3 pg/g and the median detection limit was 1.2 pg/g), only 4 had detection limits greater than 15 pg/g. They were all for PCB congener number 44. In each instance, the detection limits for the nondetect results accounted for less than 0.5% of the total PCB result.

Accuracy – Accuracy was measured as the percent recovery (%R) of an analyte in a reference standard (LCS or CRM) or spiked sample (MS). For round 1 analyses, All LCS recoveries were within acceptance limits. The mean recoveries for 12 of 14 CRM target analytes were within acceptance range of 50-150%. Forty-three of the 45 applicable matrix spike recoveries were within acceptance ranges. For round 2 analyses, All LCS recoveries were within acceptance limits. The mean recoveries for 12 of 14 CRM target analytes were within an acceptance range of 50-150%. All of the 68 applicable matrix spike recoveries were within acceptance ranges. Since the vast majority of spike recoveries were within acceptance ranges, the overall level of accuracy achieved for the analyses for both rounds of data is considered to be acceptable.

Precision – Precision of laboratory measurements was evaluated by the comparison of sample/sample duplicate results. The overall analytical precision of the analyses is considered to be acceptable as all laboratory duplicate measurements for both rounds of analyses satisfied the applicable evaluation criterion defined in the SAQAPjP.

Completeness – All analytical results are considered to be valid and usable for meeting project objectives. Valid results include those qualified as estimated or nondetect. As such, the analytical completeness for this data set is 100%.

Representativeness – Representativeness was maintained during the sampling effort by completing sampling in compliance with the HHRA work plan and relevant SOPs. During the first round of analyses, one field duplicate sample was prepared for each sample population (i.e. White Grunt target reef, White Grunt reference reef, Vermilion Snapper target reef, and Vermilion Snapper reference reef). The field duplicate results suggest that the fish tissue samples are representative of the medium sampled. No field duplicate samples were analyzed associated with the second round of analyses. However, non-homogenized splits (the second fillet) of all second round field samples were analyzed by a second laboratory using a differing analytical method. Excellent agreement was observed between the two sets of results, further supporting the conclusion that the Method 1668 fish tissue sample analyses performed by AXYS are representative of the medium sampled

Comparability – As the samples within both sets were analyzed in accordance with the quality assurance and quality control measures prescribed by the analytical method and the SAQAPjP,

only one non-target PCB congener (PCB193). As such, risk calculations for the dioxin-like congeners should not be significantly affected by the potential high bias in PCB concentrations due to coelution."

and acceptable levels of overall accuracy and precision were obtained, the data within each set and across the two sets are considered to be comparable to each other.

Based on the above data validation findings, the overall conclusion was that the data for both rounds of sampling are considered usable for meeting project objectives and are sufficiently comparable to be pooled for use in the risk assessment.

5.1 SUMMARY OF TECHNICAL APPROACH

5.1.1 Overview

For characterization of potential human health risks under the food-chain scenario, the concentration of PCB analytes and total PCBs for individual fish caught at the target reef were compared to the UTLs derived from the reference reef data for that fish species. In addition, a non-parametric Wilcoxon Rank Test was used to determine whether there was a significant difference in PCB concentrations between the target and reference reefs. In response to the EPA comments (EPA 2001b), even if none of the fish data were found to exceed their corresponding UTL, the Navy would proceed with the quantitative assessment of human health risks. Section 5.1.3 concludes that, with few exceptions, there was a difference in the PCB concentrations between the two reefs. Therefore, the HHRA was performed in accordance with the technical approach described in the draft HHRA work plan, as summarized below.

In the HHRA, risks were estimated for the ingestion of each separate fish species for both the reference reef and the target reef. Because fish caught at the reefs could be brought home and eaten by children (i.e., a more sensitive population than adults), ingestion of fish by children was included in the HHRA as a conservative measure. Calculations of non-cancer hazards are based solely on childhood exposure. Cancer risk calculations are based on combined child and adult exposure.

Potential cancer risks and non-cancer hazards for both deterministic and probabilistic evaluations were calculated using standard EPA risk equations (EPA 1989a). For the deterministic evaluation, calculations were performed using standard EXCEL© spreadsheets. For the probabilistic evaluation, calculations were performed using a Monte Carlo simulation package, Crystal Ball© by Decisioneering Inc. of Denver, Colorado. The governing equations used to calculate risks are shown below:

Non-cancer hazard (based on child exposure only):

$$HI = \frac{(CF * IR_c * FI * EF * ED_c)}{(BW_c * AT_{nc})} * \frac{1}{RfD}$$

Where:

HI = Hazard Index (unitless)

CF = Chemical concentration in fish tissue (mg/kg)

IR_c = Fish ingestion rate in children (kg/day)

FI = Fraction of Fish Ingested (unitless)

EF = Exposure frequency (days/year)

ED_c = Exposure duration for children (years)

BW_c = Body weight of child (kg)

AT_{nc} = Averaging time for non-carcinogens (365 days/year * ED)

RfD = Oral Reference dose (mg/kg/day)

Cancer risk (based on combined child and adult exposure):

$$CR = \frac{CF * EF * FI * (\frac{IR_c * ED_c}{BW_c} + \frac{IR_a * ED_a}{BW_a})}{AT_c} * SF$$

Where:

CR = Cancer risk (unitless)

CF = Chemical concentration in fish tissue (mg/kg)

EF = Exposure frequency (days/year)

IR_a = Fish ingestion rate in adults (kg/day)

ED_a = Exposure duration for adults (years)

BW_c = Body weight of child (kg)

BW_a = Body weight of adults (kg)

AT_c = Averaging time for carcinogens (25,550 days)

SF = Cancer slope factor $(mg/kg/day)^{-1}$

FI = Fraction of Fish Ingested

5.1.2 Data Compilation

Validated data were compiled into six data categories for use in the HHRA. Each category contains data of finfish samples analyzed for 24 analytes/analyte classes. The total number of data sets is 144 (six times 24). The number of fish samples collected for each category are listed below:

- White Grunt, Target Reef (20 samples)
- White Grunt, Reference Reef (20 samples)
- Black Sea Bass, Target Reef (11 samples)
- Black Sea Bass, Reference Reef (20 samples)
- Vermilion Snapper, Target Reef (20 samples)
- Vermilion Snapper, Reference Reef (22 samples)

The 24 PCB analyte data sets include:

- 10 homologue groups (mono- through deca-chlorinated biphenyls)

- Total PCBs
- 13 dioxin-like PCBs (congener numbers 77, 105, 114, 118, 123, 126, 156, 157, 167, 169, 170, 180, and 189)

5.1.3 Calculation of Upper Tolerance Limits and Wilcoxon Rank Sum Test for Target and Reference Reef Species

The UTL for each analyte is based on the mass of total PCB in each homologue group, total PCB, or the mass of individual dioxin-like PCB congener per unit mass of fish on a wet-weight basis. The laboratory reported the analytical results in picogram per gram (pg/g), which can be converted to milligram per kilogram (mg/kg) by dividing the analytical result by one million, i.e., (picogram/gram)/10^{-6}.

UTLs were calculated for the Vermilion Snapper and White Grunt caught at the reference reef, with and without lipid normalization. Tests for normality showed that most analytes were either lognormal or unknown in their data distribution. The 95% UTLs for each data set were calculated based on a lognormal distribution. The data set was first transformed by taking the natural logarithm of each analyte concentration. The mean and standard deviation of the transformed data were calculated by standard statistical methods. The equation below was used to calculate the 95% UTL:

$$UTL = e^{(x+(K*s))}$$

Where:

UTL = Upper Tolerance Limit

x = mean of the log transformed data set

s = standard deviation of the log transformed data set

K = K statistic

A K statistic with a 95% confidence level was used to calculate the 95% UTL for all three species of fish (Black Sea Bass, White Grunt and Vermilion Snapper). Comparisons of the 95% UTL for the reference reef fish to the corresponding average and maximum concentrations for each analyte in the target reef fish are presented in Table 5-1.

The maximum PCB concentrations in White Grunt from the target reef exceeded the 95% UTL for all (24 of 24) corresponding PCB concentrations in White Grunt from the reference reef. The average PCB concentrations in White Grunt from the target reef exceeded the 95% UTL for the corresponding PCB concentrations in White Grunt from the reference reef for 21 of 24 PCB analytes. The maximum PCB concentrations in Black Sea Bass from the target reef exceeded the 95% UTL for the corresponding PCB concentrations in Black Sea Bass from the reference reef for 22 of the 24 PCB analytes. The average PCB concentrations in Black Sea Bass from the target reef exceeded the 95% UTL for the corresponding PCB concentrations in Black Sea Bass from the reference reef for 15 of 24 PCB analytes. The maximum PCB concentrations in Vermilion Snapper from the target reef exceeded the 95% UTL for the corresponding PCB concentrations in Vermilion Snapper from the reference reef for 20 of the 24 PCB analytes. The average PCB concentrations in Vermilion Snapper from the target reef exceeded the 95% UTL

for the corresponding PCB concentrations in Vermilion Snapper from the reference reef for 6 of 24 PCB analytes.

Calculations of the 95% UTL were also performed on the original phase I data set (White Grunt and Vermilion Snapper only) for lipid-normalized PCB concentrations (i.e., correction of the PCB concentration to a weight PCB/weight Lipid basis) in the reference reef fish. Comparison of the lipid normalized PCB concentrations in target reef fish to the lipid-normalized 95% UTLs resulted in similar conclusions to those obtained using data that was not lipid-normalized. Lipid-normalized target reef PCB concentrations generally exceeded the lipid-normalized reference reef 95% UTLs. The exceedance was more pronounced in the White Grunt than the Vermilion Snapper. Based on this review of Phase 1 data, the differences in PCB concentrations between the reference and target reef fish did not appear to be due to the lipid content of the fish. Because of this, calculations were not performed on lipid-normalized data for the combined data sets (Phases 1 and 2).

The exceedances above the UTLs suggest that PCB concentrations in the target reef fish tissue are higher than the same PCB analytes in the reference reef fish. To confirm the UTL finding and to show that there is a statistically significant difference between PCB concentrations in fish at both reefs, a Wilcoxon Rank Test was performed. The Wilcoxon Rank Test is a standard, non-parametric statistical function that compares two data sets to determine if the two individual data sets may have arisen from the same overlying data set. It helps to determine if the differences observed in statistical results between fish from the reference and target reefs are the result of true statistical differences or due to sampling differences from a larger sample pool. Since the Wilcoxon Test is non-parametric (i.e., does not rely on determining the distribution of the data), data were not transformed. The results of the Wilcoxon Tests are presented in Table 5-2 and Appendix G. A probability of <0.0500 (i.e., 95% Confidence) is generally considered statistically significant. PCB concentrations found in White Grunt from the target reef are statistically different from corresponding PCB concentrations in White Grunt from the reference reef for all PCB analytes. PCB concentrations in Black Sea Bass from the target reef are statistically different from corresponding PCB concentrations in Black Sea Bass from the reference reef for 22 of the 24 PCB analytes. PCB concentrations in Vermilion Snapper from the target reef are statistically different from corresponding PCB concentrations in Vermilion Snapper from the reference reef for 15 of the 24 PCB analytes.

The UTL and Wilcoxon results provided the basis for the decision that a quantitative HHRA should be conducted to evaluate human health risks for the fish ingestion exposure pathway.

5.2 EXPOSURE ASSESSMENT

5.2.1 Site Conceptual Exposure Model

The Site Conceptual Exposure Model (SCEM) (Figure 5-1) hypothesizes the manner in which the chemicals of potential concern (i.e., PCBs) are released and transported from the source location to the point of exposure, and the routes by which the PCBs can enter the human body. The SCEM was developed in the draft HHRA work plan and used as a tool to guide the fish collection and sampling strategy so that the data can best represent the nature and extent of any potential fish contamination at the target reference. Specifically, the SCEM serves as the basis for scoping the sampling program by identifying the sampling locations and types of samples to

be collected. The SCEM was developed based on the Navy's understanding of the source and characteristics of PCBs, their transport mechanisms, potential exposure routes, and human activities that could result in exposure. The SCEM was used to identify the fish ingestion exposure pathway as a complete and significant pathway for the HHRA. If performances of additional risk assessments are warranted to reduce uncertainties, the SCEM can be used to guide identification of data needs and data collection strategy in support of such assessments. The SCEM in this project has the following elements:

- Chemical Sources - The sources of PCBs within sunken Navy vessels are primarily associated with residual PCBs in material/equipment/articles that have not been completely removed. The sources are originated from the PCB-containing non-liquid construction materials within the vessels such as non-oil filled electrical cables, enclosed electronics, felt gaskets, engine mounts, sealants, and heat resistant paints. Areas where PCB residuals or PCB-containing materials are most likely to be found on vessels that are:
  - constructed before 1979;
  - powered by boilers/turbines;
  - provide repair and maintenance, services such as
  - surface tenders; and
  - have heavy electrical equipment such as rescue-salvage-towing vessels.

  Certain classes of vessels and compartments within these vessels are potential sources of PCBs.[5] The PCB residuals and PCB-containing materials are considered the primary sources of PCBs. The secondary and tertiary sources of PCBs are organisms at the lower and higher trophic levels that have ingested or taken in PCBs via bioconcentration and bioaccumulation.
- Release/Transport - Because of the low water solubilities of PCBs, the release rate of PCBs has been demonstrated to be slow. Loss of integrity of PCB-containing materials due to sinking operations could increase the surface area for leaking and leaching. With the leaking/leaching action as the primary release mechanism, PCBs may be released into the water column, and eventually settle and adsorb onto sediment. Through the mechanical actions of burrowing worms, feeding on benthic macroinvertebrates by predators, and movements of underwater currents, secondary release mechanisms such as desorption and resuspension of PCBs from sediment may occur. PCBs could be transported from the water column and sediment through the food chain from lower trophic levels to the human food sources, i.e., finfish. The final transport mechanism requires catching these finfish for human consumption.
- Routes of Exposure - PCBs are lipophilic compounds and can be readily absorbed by organisms across the cellular-water interface. Uptake of PCBs by biota may bioconcentrate PCBs, with subsequent bioaccumulation and biomagnification resulting in higher tissue

[5] Older operating vessels with heavy equipment and vessels with boiler-powered propulsion are likely to have PCBs or PCB-containing materials. Using the above criteria, these classes or types of vessels may contain PCBs: Edenton (rescue-salvage-towing); Kitty Hawk/Forestall (aircraft carrier/CVs); L.Y. Spear (surface/submarine tenders); and WASP (amphibious landing/LHD), and others. The ex-VERMILLION falls into the class of Amphibious Landing Craft.

concentrations among upper trophic organisms. As shown in the SCEM, epibenthic invertebrates and finfish could absorb PCBs directly from the water-column and benthic invertebrates could absorb PCBs directly from sediment. Predatory and scavenging invertebrates and small fish may be exposed to PCBs via ingestion of living organisms and carrion. Larger finfish may be exposed to PCBs via the ingestion of lower trophic level organisms, including crustaceans, mollusks, small fish, and worms.

- Potential Receptors - Humans may be at risk from the ingestion of higher trophic level organisms (e.g., finfish species), which inhabit sunken Navy vessels. Artificial reefs are not used for commercial fishing. Because of their placement several miles (or more) from the shoreline, they are not readily accessible to subsistence anglers. Recreational anglers represent the population with the potential for greatest exposure. Grouper, Black Sea Bass, White Grunt, and Vermilion Snapper are considered prime food fish, and are highly sought after by recreational anglers. Ingestion of these species of finfish by recreational anglers represents the most likely high-end exposure conditions. For evaluation of potential non-cancer hazard, a child scenario represents a worst-case scenario, while combined child/adult exposure represents a worst-case scenario for evaluating cancer effects.

5.2.2 Selection of PCBs as Chemicals of Potential Concern

The draft HHRA work plan explains the rationale why PCBs were selected as the chemicals of potential concern (COPCs), based on stipulated criteria. PCBs are the only COPCs in the sunken vessel for the creation of artificial reef because they meet the five criteria outlined in Section 4.2.3 of the work plan. They are also regulated under Section 6 of the Toxic Substances Control Act (TSCA) because of their persistence in the environment , bioaccumulation potential, and toxicity to humans and ecological receptors. In other words, regulatory issues are based on the physiochemical and toxicological concerns exhibited by these chemicals.

EPA health risk assessment guidance (EPA 1989a) allows the comparison between background and potentially impacted media as an approach to identify COPCs. Site release history is also an important yardstick to conclude whether a certain contaminant should be included as COPCs. Pursuant to the above guidance and the decision flow for this project (Figure 4-1), the maximum level of a PCB analyte detected in an edible fish species caught at the target reef was compared to the 95% upper tolerance limit (UTL) for that species caught at the reference reef. The objective was to determine whether there is a difference in PCB concentrations in fish between the target and reference reefs. If there were a difference, PCBs would be selected as the COPC.

In response to EPA comments on the work plan (EPA 2001b and Versar 2002), the screening process described above was not used to preclude assessing the health risk from the ingestion of fish caught at the target reef. In other words, PCBs were still included as COPCs in the HHRA without regard to whether the maximum PCB level detected in a fish species at the target reef exceeded its respective UTL. Because PCBs could be released from sunken vessel with PCB-containing products, PCBs were COPCs in fish at the target reef. EPA did acknowledge that, where PCB levels were below their respective UTLs, the level of health concern should also be low.

5.2.3 Estimation of Exposure Point Concentrations

For the fish ingestion exposure pathway, the exposure point concentration (EPC) is defined as the concentration of PCBs in the fish tissue (fillet) ingested. In this HHRA, the unit of measure for the EPC is milligram of PCB analyte per kilogram of the ingested fish (mg/kg) on a wet weight basis.

For quantitative risk evaluation, the EPC was based on total PCBs[6]. In addition, the EPCs for 13 dioxin-like PCB congeners were also compiled for quantitative assessment of uncertainty[7]. The approach used to calculate EPCs for the deterministic risk evaluation was in accordance with EPA (1992b), a method that entails statistical averaging of all sample data. EPCs were developed for each species caught at the reference and target reefs. For samples where the chemical is reported as nondetected, the chemical was assumed to be present at one-half of the reporting limit or sample quantitation limit (SQL), in accordance with EPA (1989a). For PCBs analyzed by Method 1668, the reporting limit is equal to the sample-specific (and analyte-specific) detection limit, which in turn is calculated from the noise level present during analysis of each sample. From this information, a 95-percent upper confidence limit (UCL) on the mean was calculated for the PCB analytes. The concentration associated with the 95-percent UCL or the maximum concentration detected, whichever is lower, was adopted as the reasonable maximum exposure (RME) exposure point concentration. Use of the maximum detected concentration, if less than the calculated RME concentration, is acceptable per EPA risk assessment guidance (1989a). Where the data distribution of a particular PCB analyte was determined to be lognormally distributed (Section 5.1.2), those fish data were first transformed by taking the natural logarithm of each result. The mean and standard deviation of the log-transformed data were calculated by standard statistical methods. The equation below was then used to calculate the 95% UCL to represent the EPC under the high-end (RME) exposure scenario:

$$UCL = e^{(x + 0.5s^2 + sH/\sqrt{n-1})}$$

where:

UCL = upper confidence limit
e = constant (base of the natural log, equal to 2.718)
x = mean of the log transformed data
s = standard deviation of the log transformed data
H = H statistic (e.g., from table published in Gilbert, 1987)
n = number of samples

The derivation of UCL for normally distributed PCB data was conducted in accordance with this equation per EPA (1992b).

[6] Total PCB concentrations were reported by the analytical laboratory. In addition, risk and hazard associated with each homologue group were summed to represent the total PCB risks and hazards.

[7] Congener analyses were performed and reported because of the regulatory and health concerns associated with the dioxin-like PCBs. A quantitative risk evaluation based on the relative carcinogenic potencies of these congeners to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and discussion of the risk findings are presented in the HHRA discussion of risk assessment results and uncertainties.

$$UCL = x + t(s / \sqrt{n})$$

where:

UCL = upper confidence limit
x = arithmetic mean (mean of untransformed data)
s = standard deviation of the untransformed data
t = Student-t statistic (Gilbert 1987)
n = number of samples

The accuracy of the above statistical methods relies on the assumption that the data set being analyzed is normally distributed (i.e., a normal or lognormal distribution). For sample data that are not normally distributed, the use of the H or t-statistic to estimate the 95% UCL can result in a 95% UCL value that is unrealistically large. Based on EPA guidance, a non-parametric statistical method for calculating the 95% UCL may be more appropriate for chemicals displaying a non-lognormal distribution (EPA, 1997b). Although a technical discussion of the available non-parametric methods is beyond the scope of this document, these include several bootstrap and jackknife methods. Depending on the nature/statistical distribution of the data, if the H or t-statistic approaches were deemed to be inappropriate, a non-parametric method was used to calculate exposure point concentrations.

Table 5-3 presents the exposure point concentrations to be used in the deterministic evaluation. The RME exposure point concentration for an analyte was based on the lesser of the 95% UCL or the maximum detected concentration. The average concentration of an analyte was used as the exposure point concentration for the average exposure scenarios. Exposure point concentrations for the probabilistic evaluation was based on the measured chemical distributions from fish tissues, after applying a best-fit test to the data, or by assuming lognormal distribution of the PCB data for a particular fish species or population for that reef.

5.2.4 Identification of Exposure Parameters and Assumptions

Exposure parameters and their input values for the deterministic risk assessment are presented in this section. Appendix E presents the probabilistic density functions (PDFs) for individual parameters used in the probabilistic risk assessment to assess uncertainty associated with the deterministic risks and hazards.

The Guidelines for Exposure Assessment (57 FR 22888) recommend against the use of high-end values for each exposure parameter because the compounding effect of multiple upperbound values would place the estimated exposure in the realm of Theoretical Upper-bound Exposure (TUBE). The guidelines suggest that high-end exposure should be over the 90th percentile of the total exposure. In the Risk Assessment Guidance for Superfund (EPA 1989a), EPA recommends using two to three exposure parameters that are high-end (one of which is the exposure point concentration) and the remaining central tendency values to calculate the RME. As shown below, the above approach was followed to estimate the lifetime average daily dose or intake for the risk assessment. High-end exposure parameters used in the risk assessment include the adult fish ingestion rate (i.e., use of the 95th percentile) and the child and adult exposure durations (i.e., assuming that people will eat fish from the ex-VERMILLION reef for thirty years).

The key exposure parameters used to evaluate fish ingestion include the exposure frequency, exposure duration, fish ingestion rate, and body weight. Specific exposure parameters used in the risk assessment presented in this section have been derived from a number of sources, including EPA guidances and the open scientific literature. The following describes the assumptions and rationale used to evaluate potential exposure between child and adult anglers in the deterministic and probabilistic risk assessments:

Fish ingestion rate for adults (IR_a): The Exposure Factors Handbook (EPA, 1997a, Table 10-52) provides a breakdown of marine finfish ingestion rates among anglers from different regions of the United States. This information provides a useful means of evaluating region-specific risks that could potentially be associated with placement of artificial reefs in different coastal regions of the U.S. The values presented below are based on survey information specific to the South Atlantic coastline (defined as North Carolina, South Carolina, Georgia and the Atlantic coastline of Florida). The 95th percentile ingestion rate of 0.0159 kg/day was used in the deterministic evaluation for RME exposure. The mean ingestion rate of 0.0047 kg/day was used for average (CTE) exposure.

For the probabilistic risk assessment, the following information was used:

Mean: 0.0047 kg/day

95th percentile: 0.0159 kg/day

Distribution: Lognormal

Fish ingestion rate for children (IR_c): The fish ingestion rate for children is a scaling factor multiplied by the adult fish ingestion rate for the locality of the reefs (IR_c) being evaluated, i.e., South Atlantic Coastline. The rates are 0.0159 kg/day (95th percentile) and 0.0047 kg/day (mean). For the probabilistic risk evaluation, the IR_c term was based on the IR_a distribution, but incorporated the same scaling factor to account for the difference in child and adult fish ingestion rates. IR_c was defined using the following equation:

$$IRc = IRa * \frac{A}{B}$$

Where A and B represent the mean fish consumption rate for children and adults, respectively, without the consideration of their geographic location. The rato of A/B is the scaling factor. The Exposure Factors Handbook (EPA, 1997a, Table 10-61) provides a breakdown of recreation fish consumption in grams per day. These are mean fish intakes for individuals who eat fish and reside in households with recreational fish consumption. From the table, the age group of 1 to 5 years has a mean ingestion rate of 0.00563 kg/day. This value is used for A, the numerator of the scaling factor. From the same table and category, the mean adult recreational fish ingestion rates for five age groups are averaged (age groups 21 to 40, 40 to 60, 60 to 70, 71 to 80, and 80+) to provide B, the demoninator. B has an average value of 0.0158 kg/day. The scaling factor is calculated to be 0.356. Therefore, IR_c for the RME deterministic risk assessment is 0.0159 kg/day * 0.356, that equals 0.00567 kg/day. The IR_c for CTE deterministic risk assessment is 0.0047 kg/day * 0.356, that equals 0.00167 kg/day.

For the probabilistic risk assessment, the randomly selected adult ingestion rates above were adjusted by the scaling factor (A/B), i.e., 5.63/15.8 or 0.356, and the product of multiplication was used as an input for the child ingestion rate parameter, IR_c

Fraction of Fish Ingested (FI): The fish ingestion rates used above represent the total amount of marine finfish that an angler is expected to eat. Because all of the fish that an angler eats is not expected to come from a single source (e.g., solely from the target reef), an FI term has been introduced into the risk equations to account for this fact. A 1992 study of private boat anglers indicated that, of the total days spent fishing on artificial marine reefs, 3.7% of those days were spent fishing on the ex-VERMILLION reef (Rhodes, R.J., M. Bell and D. Liao, 1994). Communications with Bob Martore of SCDNR have indicated that a similar, unpublished study conducted in 1999 showed that, of the total days spent fishing on artificial marine reefs, 1.4% of those days were spent fishing on the ex-VERMILLION reef. The main reason for the drop in fishing time spent on the ex-VERMILLION is believed to be due to the increased number of reefs off the South Carolina coast when the later study was conducted. Although these studies indicate a potentially lower fraction of fish taken from the ex-VERMILLION reef, in order to insure a conservative estimation of risks, an FI factor of 0.1 (i.e., 10%) was used for the deterministic evaluation. This implies that 10% (i.e., fish taken from the ex-VERMILLION reef are eaten approximately 36 days each year) of the total marine finfish that an angler eats can be expected to come from a particular source. Therefore 0.1 was assumed in the deterministic HHRA (NEHC, July 2002). This assumed value was based on frequency (time spent) and not on the actual intake or consumption of marine finfish of the ex-VERMILLION.

In May 2003, SCDNR conducted a fish consumption survey to determine the validity of the 0.1 value for the FI term specific for marine finfish consumption. The survey data was then used by the Navy to derive the FI terms based on a statistical approach. Appendix J presents the derivation of the FI term. This appendix, entitled "Revised Derivation of a Fraction Ingested [FI] Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina" (NEHC, 2003c), contains the following addenda:

- "Derivation of a Marine Finfish-Specific Fraction Ingested (FI_{MFF}) Term for Use in the REEFEX Human Health Risk Assessment" (NEHC, 2003d)
- "Methods Used in Conducting a Fish Consumption Survey of South Carolina" [D. Hammond et. al., August 19, 2003].

The survey and revised derivation of the FI term confirmed that the assumed FI value of 0.1 was generally appropriate with minor modifications. Based on the review of Appendix J, EPA recommended that, for the deterministic health risk assessment, 0.14 should be used for the central tendency assessment and 0.11 for the RME assessment (Versar, October 7, 2003b).

Based on the location of the reef (>30 miles offshore) and the relatively sophisticated equipment needed to reach it, the above FI term values are considered conservative estimates. However, it should be noted that these FI term values are specific to the ex-VERMILLION, being based on surveys from anglers who fish the ex-VERMILLION. The FI term may need to be modified if future marine anglers also fish other sunken-vessel artificial reefs, since angler fishing frequency can be influenced by a number of site-specific factors, such as accessibility, depth, productivity of the reef, etc.

For the probabilistic risk assessment, the potential range of FI values was represented by a normal distribution with a mean of 0.075 and a standard deviation of 0.0084, which mathematically represents a normal distribution of input values from 0.05 (5%) to 0.1 (10%) with a mean simulated value of 0.075 (7.5%). This reflects the fact that 0.1 (10%) is considered a conservative, upper-bound value.

Exposure frequency (EF): Exposure frequency refers to the number of days per year that an individual is exposed to site contaminants. For media such as soil or water, the exposure frequency would be equal to the number of days per year that an individual spends on-site. In the case of fish consumption, the ingestion rates presented in the *Exposure Factors Handbook* (EPA, 1997a) are daily rates averaged over 365 days per year. This does not imply that consumers ingest fish on a daily basis. For both the deterministic and probabilistic evaluations, exposure frequency was not treated as a random variable, and was set at 365 days per year, a constant.

Exposure duration for children (ED_c): Exposure duration refers to the number of years in which exposure occurs. It is assumed that the most exposed angler population consists of local residents, and that the exposure duration for anglers reflects occupancy duration for residents. For the deterministic evaluation (CTE and RME), the standard default exposure duration of 6 years was used, based on the assumption that the entire 0-6 year period is spent at a single residence. Residency duration/distribution data for 0-6 year old children for use in probabilistic risk assessment have not been developed for South Carolina, but have been developed for at least one other state. Exposure duration values for a residential population, presented below, are identified in the Ohio EPA guidance "*Support Document for the Development of Generic Numerical Standards and Risk Assessment Procedures*" (OEPA, 1996). These values were used to define a custom probability distribution, based on 1990 U.S. Census residency occupancy period data for Ohio.

It should be noted that for evaluation of carcinogens, the total exposure duration incorporates both child and adult exposure durations, assuming that ED_c and ED_a are not correlated values. OEPA probabilistic risk guidance specifies that adult distributions should be assumed for children, except that all probabilities above 6 years are truncated and added to the sixth year. The custom distribution defined below includes a maximum of 6 years.

Years At One Residence	Relative Probability
1	0.18
2 to 5	0.27
6	0.55

Exposure duration for adults (ED_a): As discussed for the child exposure duration, the adult exposure duration for anglers is based on residential occupancy. For deterministic evaluation, the standard default value of 24 years will be used for RME exposure. This value is based on the 90th percentile value of 30 years for time spent at a single residence, assuming 24 years as an adult and 6 years as a child. For estimates of average (CTE) exposure, an adult exposure duration of 3 years was used based on the 50th percentile value of 9 years for time spent at a single residence, assuming 3 years as an adult and 6 years as a child. The exposure duration term as presented in the Ohio EPA guidance "*Support Document for the Development of Generic*

Numerical Standards and Risk Assessment Procedures" (OEPA, 1996) is defined by a custom probability distribution, based on 1990 U.S. Census residency occupancy period data for Ohio.

Years At One Residence	Relative Probability
1	0.18
2 to 5	0.27
6 to 10	0.13
11 to 20	0.20
21 to 30	0.11
31 to 50	0.11

Body weight for a child (BW_c): The body weight term for children to be used in the probabilistic evaluation is that presented in Smith (1994, Use of Monte Carlo simulation for human exposure assessment at a Superfund site, *Risk Analysis* 14:433-439). This term is defined as a truncated normal distribution for an equal population of male and female children. The mean value of 15 kg was used in the deterministic evaluation.

Mean	15 kg
Standard Deviation	1.95 kg
Minimum	3 kg (assumed value based on small infant)
Maximum	32 kg (based on the minimum adult value)

Body weight for an adult (BW_a): The body weight term for adults used in the probabilistic evaluation is that presented in Finley et al. (Finley, B., Proctor, D., Scotte, P., Harrington, N., Paustenbach, D., and Price, P., 1994, Recommended distributions for exposure factors frequently used in health risk assessment. *Risk Analysis*, 14:533-553). This term is defined as a truncated normal distribution for an equal population of men and women. The mean value of 71 kg was used in the deterministic evaluation.

Mean	71 kg
Standard Deviation	15.9 kg
Minimum	32 kg
Maximum	115 kg

Averaging time for non-carcinogens (AT_{nc}): The averaging time for non-carcinogens (both deterministic and probabilistic) is a dependent term, defined as ED_c x 365 days/year.

Averaging time for carcinogens (AT_c): The averaging time for carcinogens (both deterministic and probabilistic) is a fixed term, defined as 25,550 days.

5.3 TOXICITY ASSESSMENT

Toxicity values for total PCBs (reference doses [RfDs] and slope factors [SFs]) were used in the HHRA for the assessment of noncarcinogenic and carcinogenic effects, respectively. These values were obtained from EPA's Integrated Risk Information System located at URL:

http://www.epa.gov/iriswebp/iris/index.html

The RfD is defined by EPA as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious [noncarcinogenic] effects (EPA 1992c).

Noncarcinogenic effects are adverse health effects other than cancer that can be systemic or localized, and can be acute, (single or multiple exposure for periods up to two weeks), subchronic (short-term, defined in humans as intervals between two weeks and seven years), or chronic (long-term, seven years or more). The types of health effects can be different between humans and tested species based on which toxicity information is developed. In humans, chloracne (disfiguring skin lesions) is the primary noncancer effect from PCB exposure. Animal studies provide the bulk of information concerning the noncarcinogenic effects of PCBs (EPA 1986). Acute effects caused by PCBs are elicited after high exposure (high dosing) for a short period of time. They include death, dyspnea, diarrhea, depression, and salivation. Subchronic effects caused by PCBs include suppressed weight gain, increase in enzyme level, anorexia, kidney and liver enlargement, lymphocytopenia, increased thyroid activity, and many other tissue effects. Chronic effects include reduced body weight, enlarged liver, increased serum cholesterol, fatty liver degeneration, skin lesions, lost finger nails, reproductive failure, fetal resorption and death, partial alopecia, and others. These studies provide information for the development of the RfD for PCBs.

IRIS provides RfD for two total PCB mixtures, Aroclor 1254 and Aroclor 1016, but no RfDs for individual congeners. It is noteworthy that these two RfDs are relatively similar to one another (i.e., 2E-5 mg/kg-day for Aroclor 1254; 7E-5 mg/kg-day for Aroclor 1016). While it is unlikely that weathered PCBs found on sunken ships consist of the same mixture and ratio of congeners as either of these specific Aroclors, hazards can still be estimated using the more conservative of these two values (**2E-5 mg/kg-day**) as long as it is recognized that this approach entails a significant level of uncertainty. These uncertainties are discussed in the uncertainty analysis. (It should be noted that the above RfDs are based on Aroclors, which are total PCBs which quantitation represents as a mixture of PCBs with various degree of chlorination, i.e., 54% for Aroclor 1254 and 16% for Aroclor 1016. There are proportionally higher chlorinated PCB congeners in Aroclor 1254 than Aroclor 1016; yet both Aroclors have PCBs of various chlorination. The hazard quotient is the total PCBs divided by the RfD of Aroclor 1254, which is the same as the sum of hazard indices from each total PCB homologue (total monochlorinated biphenyl/RfD + total dichlorinated biphenyl/RfD + total trichlorinated biphenyl/RfD, etc.)

The SF is an upperbound estimate of the incremental cancer risk for humans and is expressed as the probability of risk per milligram (mg) of chemical exposed per kilogram (kg) body weight per day for lifetime exposure. The SFs are derived mathematically by EPA using extrapolation models with animal or human data, and the resulting SFs are highly conservative slopes or rate constants that correspond to the 95th percentile confidence level to predict excess cancer occurrence per life time given the daily exposure of one mg/kg-day. Carcinogenic effects are

characterized by uncontrolled cellular growth or cell division in humans or animals. The uncontrolled growth typically causes many side effects and weakening of the immune system, resulting in complications and death. While there is no clear evidence that PCBs cause cancer in humans, PCBs have been shown to cause various types of cancer in tested animals. Types of tumors induced in animals include hepatocellular adenomas, carcinomas, cholangiomas, and cholangiocarcinomas, a rare form of liver tumors. The incidence rate of cancer is represented by the SF, i.e., incidence rate per unit exposure.

Carcinogens with EPA-derived slope factors are also given an EPA weight-of-evidence classification whereby potential carcinogens are grouped according to the likelihood that the chemical is a human carcinogen, depending on the quality and quantity of carcinogenic potency data for a given chemical. PCB is classified as a B2 (probable human carcinogen) according to IRIS. EPA defines B2 as carcinogens that have sufficient evidence in animals and inadequate or no evidence in humans of carcinogenicity.

The scientific basis for justifying the use of TEQs for PCBs has been reviewed in the effort to re-assess the dose-response relationship of PCBs (EPA 1996). A draft document describing the science of cancer dose-response assessment and application for PCB mixtures was reviewed by an external panel assembled by EPA in May 1996. The IRIS database has released the recently peer-reviewed range of carcinogenic potency factors. The re-assessment has resulted in a range of carcinogenic potency or slope factors (SFs) (from 0.4 to 2.0 $[mg/kg\text{-}day]^{-1}$) for all routes of exposure, and the science policy recommending their use has also been issued by the EPA. In the document, the agency indicates that the higher chlorinated congeners as major components of the higher-percent Aroclors such as Aroclors 1260 and 1254 are of more concern among all PCBs because of their persistence in the environment and evidence of producing dose-related carcinogenicity. In accordance with the HHRA work plan, the following SFs were used for various PCB homologue groups for estimating carcinogenic risks:

- Total PCBs (mono- and di-chlorobiphenyls): The SF for these homologues is 0.4 $(mg/kg\text{-}day)^{-1}$; and
- Other total PCBs (tri- through deca-chlorobiphenyls): The SF for these homologues is 2.0 $(mg/kg\text{-}day)^{-1}$.

In addition to RfD and SF, the oral toxicity factor for assessing the combined carcinogenic and non-carcinogenic effects of total PCBs was also used in the HHRA. The total toxicity factor, which has a value of 4.0 $(mg/kg\text{-}day)^{-1}$was obtained from *PCB Risk Assessment Review Guidance Document* (EPA 2000).

For assessing uncertainty associated with the RME deterministic risk, the carcinogenic effects of 13 dioxin-like PCB congeners were evaluated according to the World Health Organization's (WHO) toxicity equivalency quotients (TEQs) relative to 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD). These TEQs are provided in Table 6 of EPA (2000) and the source of these values is Ahlborg et al. (1994). Multiplying the TEQ with the SF for TCDD (1.5×10^5 $[mg/kg\text{-}day]^{-1}$) provides the surrogate toxicity value for assessing carcinogenic risks from dioxin-like PCBs. Considerable uncertainties are inherent in the use of the TEQ approach because there is a lack of, or very limited, carcinogenicity data or chronic bioassays to establish the PCB-TEQ relationship with TCDD. Details are as follow:

	TEQ	SF
• Non-Ortho Congeners:		
3,4,3',4'-Tetrachlorobiphenyl (Congener No. 77)	0.0005	75
3,4,5,3',4'-Pentachlorobiphenyl (Congener No. 126)	0.1	15,000
3,4,5,3',4',5'-Hexachlorobiphenyl (Congener No. 169)	0.01	1,500
• Mono-Ortho Congeners:		
2,3,4,3',4'-Pentachlorobiphenyl (Congener No. 105)	0.0001	15
2,3,4,5,4'-Pentachlorobiphenyl (Congener No. 114)	0.0005	75
2,4,5,3',4'-Pentachlorobiphenyl (Congener No. 118)	0.0001	15
3,4,5,2',4'-Pentachlorobiphenyl (Congener No. 123)	0.0001	15
2,3,4,5,3',4'-Hexachlorobiphenyl (Congener No. 156)	0.0005	75
2,3,4,3',4',5'-Hexachlorobiphenyl (Congener No. 157)	0.0005	75
2,4,5,3',4',5'-Hexachlorobiphenyl (Congener No. 167)	0.00001	1.5
2,3,4,5,3',4',5'-Heptachlorobiphenyl (Congener No. 189)	0.0001	15
• Di-Ortho Congeners:		
2,3,4,5,2',3',4'-Heptachlorobiphenyl (Congener No. 170)	0.0001	15
2,3,4,5,2',4',5'-Heptachlorobiphenyl (Congener No. 180)	0.00001	1.5

It should be noted that these EPA toxicity values were generally derived from conservative criteria, which undoubtedly contribute to an overestimation of potential hazard and risk. Current EPA policy states "EPA will not at this time accept probabilistic analyses that model toxicity values as distributions" (EPA, 1998, *Supplemental guidance to RAGS: The use of probabilistic Analysis in Risk Assessment, Part E*). As such, the toxicity values used in both the deterministic and the probabilistic risk evaluations treat the reference doses and slope factors as fixed terms.

5.4 RISK CHARACTERIZATION FINDINGS AND UNCERTAINTY DISCUSSION

This section presents risk and hazard estimates calculated in accordance with the risk assessment approach described in the previous sections and the draft HHRA work plan. Risks and hazards were calculated deterministically and probabilistically for three finfish species (White Grunt, Black Sea Bass and Vermilion Snapper) at both the target (sunken vessel) and reference reefs. As stated before, the RME hazards and risks estimated deterministically are supplemented by the other risk descriptors so that the uncertainties associated with risks and hazards can be better understood. For each finfish species, 16 risk descriptors are presented in this section. All of which should be considered in making risk management decisions. These risk descriptors are summarized below.

Three descriptors (RME risk, RME hazard, and RME combined risk/hazard for total PCBs) were used as the primary input to assess site risk associated with the fish ingestion exposure pathway from recreational fishing.

- RME Risk - Total PCB/IRIS Slope Factors
- RME Hazard - Total PCB/IRIS RfD
- RME Risk/Hazard - Total PCB/OPPT Total Toxicity Factor

Thirteen risk descriptions were used to assess uncertainties associated with the RME risk and hazard. These descriptors include:

- RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors
- RME Hazard - 13 Dioxin-like Congeners/IRIS RfD for Aroclor-1254
- Average Risk - Total PCB/IRIS Slope Factors
- Average Hazard - Total PCB/IRIS RfD
- Average Risk/Hazard - Total PCB/OPPT Total Toxicity Factor
- Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors
- Average Hazard - 13 Dioxin-like Congeners/IRIS RfD for Aroclor-1254
- Probabilistic Risk - Total PCB/IRIS Slope Factors; 95% percentile of the risk distribution
- Probabilistic Risk - Total PCB/IRIS Slope Factors; 50% percentile of the risk distribution
- Probabilistic Hazard - Total PCB/IRIS RfD; 95% percentile of the risk distribution
- Probabilistic Hazard - Total PCB/IRIS RfD; 50% percentile of the risk distribution
- Probabilistic Risk&Hazard - Total PCB/OPPT Total Toxicity Factor; 95% percentile of the risk distribution
- Probabilistic Risk&Hazard - Total PCB/OPPT Total Toxicity Factor; 50% percentile of the risk distribution

Table 1-1 presents a summary for all risk descriptors.

5.4.1 Carcinogenic Risk Under Reasonable Maximum Exposure Scenario

Carcinogenic risks from the fish ingestion exposure pathway, under the RME recreation fishing exposure scenario, were assessed for total PCBs using slope factors identified in IRIS and the total toxicity factor provided by the Office of Pollution Prevention and Toxic Substances (OPPT). The conclusions are:

- Risks were acceptable (within or lower than the typical EPA acceptable risk range of 10^{-6} to 10^{-4}) for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reef types (target and reference reefs);
- Risk from ingesting White Grunt from the target reef is more than two orders of magnitude (100 times) higher than that from the ingestion of White Grunt from the reference reef;
- Risk from ingesting Black Sea Bass from the target reef is comparable to, albeit slightly higher (five times higher) than that from the ingestion of Black Sea Bass from the reference reef; and
- Risk from ingesting Vermilion Snapper from the target reef is comparable to, albeit slightly higher (two times higher) than that from the ingestion of Vermilion Snapper from the reference reef.

To assess uncertainty associated with the above, carcinogenic risks from the fish ingestion exposure pathway (under the RME recreation fishing exposure scenario) were assessed for the 13 dioxin-like congeners using TEQs (provided by EPA [1996]) and the TCDD slope factor

(from IRIS). Conclusions, similar to those for the total PCB RME risks presented above, were found:

- Risks were acceptable (within or lower than the typical EPA acceptable risk range of 10^{-6} to 10^{-4}) for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reef types (target and reference reefs);
- Risk from ingesting White Grunt, evaluated using the TEQ method, was comparable to, albeit slightly higher, than the risk estimated using the total PCB and OPPT total toxicity factor method;
- Risk from ingesting Black Sea Bass, evaluated using the TEQ method, was comparable to, albeit slightly higher, than the risk estimated using the total PCB and OPPT total toxicity factor method; and
- Risk from ingesting Vermilion Snapper, evaluated using the TEQ method, was comparable to, albeit slightly higher, than the risk estimated using the total PCB and OPPT total toxicity factor method.

5.4.2 Carcinogenic Risk Under Average Exposure Scenario

Carcinogenic risks from the fish ingestion exposure pathway, under the average recreation fishing exposure scenario, were assessed for total PCBs using slope factors identified in IRIS and the total toxicity factor provided by the Office of Pollution Prevention and Toxic Substances (OPPT). The conclusions are:

- Risks were acceptable (within or lower than the typical EPA acceptable risk range of 10^{-6} to 10^{-4}) for ingesting White Grunt, Black Sea Bass and Vermilion Snapper from either reef;
- Risks from ingesting White Grunt from the reference reef and from ingesting Black Sea Bass and Vermilion Snapper from either reef were at or lower than the low-end of the risk range;
- Risks from ingesting White Grunt from the target reef were below 2×10^{-6}; and
- The risk calculated using the OPPT total toxicity factor was slightly higher than that calculated using the IRIS slope factors. Both risks were acceptable.

To assess uncertainty associated with the above, carcinogenic risks from the fish ingestion exposure pathway (under the average recreation fishing exposure scenario) were assessed for the 13 dioxin-like congeners using TEQs and the TCDD slope factor from IRIS. Conclusions, similar to those for the total PCB average risks presented above, were found:

- Risks were acceptable (within or lower than the typical EPA acceptable risk range of 10^{-6} to 10^{-4}) for ingesting White Grunt, Black Sea Bass and Vermilion Snapper from either reef;
- Risks from ingesting White Grunt from the reference reef and from ingesting Black Sea Bass and Vermilion Snapper from either reef were lower than the low-end of the risk range; and
- Risk from ingesting White Grunt from the target reef were approximately 2×10^{-6}.

5.4.3 Non-Carcinogenic Hazard Under Reasonable Maximum Exposure Scenario

Non-carcinogenic hazards from the fish ingestion exposure pathway, under the RME recreation fishing exposure scenario, were assessed for total PCBs using a conservative reference dose provided in IRIS. The conclusions are quite similar to those presented for carcinogenic risks for total PCBs in Section 5.4.1. They are:

- Hazards were acceptable for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reef types (target and reference reefs);
- Hazard from ingesting White Grunt from the target reef, while acceptable, is more than two orders of magnitude higher than that from the ingestion of White Grunt from the reference reef;
- Hazard from ingesting Black Sea Bass from the target reef is comparable to, albeit slightly higher (five times higher) than that from the ingestion of Black Sea Bass from the reference reef. Both hazard indices were acceptable; and
- Hazard from ingesting Vermilion Snapper from the target reef is comparable to, albeit slightly higher (two times higher) than that from the ingestion of Vermilion Snapper from the reference reef. Both hazard indices were acceptable.

To assess uncertainty associated with the above, non-carcinogenic hazards from the fish ingestion exposure pathway (under the RME recreation fishing exposure scenario) were assessed for the 13 dioxin-like congeners using the same conservative reference dose as that used for the assessment of hazard for total PCBs. The conclusions are:

- Hazards were acceptable for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reefs;
- Hazard from ingesting White Grunt from the target reef, while acceptable, is more than two orders of magnitude higher than that from the ingestion of White Grunt from the reference reef;
- Hazards from the 13-dioxin like PCBs were over 6 times lower, than hazards estimated for the total PCBs;
- Hazard from ingesting Black Sea Bass from the target reef is comparable to, albeit slightly higher (five times higher) than that from the ingestion of Black Sea Bass from the reference reef; and
- Hazard from ingesting Vermilion Snapper from the target reef is comparable to, albeit slightly higher (two times higher) than that from the ingestion of Vermilion Snapper from the reference reef.

5.4.4 Non-Carcinogenic Hazard Under Average Exposure Scenario

Non-carcinogenic hazards from the fish ingestion exposure pathway, under the average recreation fishing exposure scenario, were assessed for total PCBs using a conservative reference dose provided in IRIS. The conclusions are:

- Hazards were acceptable for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reef types (target and reference reefs);

- Hazard from ingesting White Grunt from the target reef, while acceptable, is more than two orders of magnitude higher than that from the ingestion of White Grunt from the reference reef;
- Hazard from ingesting Black Sea Bass from the target reef is comparable to, albeit slightly higher (five times higher) than that from the ingestion of Black Sea Bass from the reference reef; and
- Hazard from ingesting Vermilion Snapper from the target reef is comparable to, albeit slightly higher (two times higher) than that from the ingestion of Vermilion Snapper from the reference reef.

To assess uncertainty associated with the above, non-carcinogenic hazards from the fish ingestion exposure pathway (under the average recreation fishing exposure scenario) were assessed for the 13 dioxin-like congeners using the same conservative reference dose as that was used for the assessment of hazard for total PCBs. The conclusions are:

- There was no unacceptable hazard, above the point of departure of unity (1), associated with the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from the target and reference reefs;
- Hazard from ingesting White Grunt from the target reef, while acceptable, is approximately two orders of magnitude higher than that from the ingestion of White Grunt from the reference reef;
- Hazards from the 13-dioxin like PCBs were over 6 times lower, than hazards estimated for the total PCBs;
- Hazard from ingesting Black Sea Bass from the target reef is comparable to, albeit slightly higher (six times higher) than that from the ingestion of Black Sea Bass from the reference reef; and
- Hazard from ingesting Vermilion Snapper from the target reef is comparable to, albeit slightly higher (two times higher) than that from the ingestion of Vermilion Snapper from the reference reef.

5.4.5 Probabilistic Risk and Hazard

Probabilistic risks and hazards were characterized in accordance with input data and their associated distribution described in Section 5.24 and the draft HHRA work plan. The conclusions are as follow:

- None of the probabilistic risks for total PCBs associated with ingesting White Grunt, Black Sea Bass and Vermilion snapper, based on the IRIS slope factors or the OPPT total toxicity factor, at the 95% risk distribution level exceeded the EPA acceptable risk range;
- None of the probabilistic hazards for total PCBs associated with ingesting White Grunt, Black Sea Bass and Vermilion snapper, based on the IRIS RfDs, at the 95% risk distribution level exceeded the EPA acceptable hazard index of unity (1.0);

5.4.6 Conclusions, Uncertainties, and Recommendations

Risks and hazards were acceptable for the ingestion of White Grunt, Black Sea Bass and Vermilion Snapper from both reef types (reference and target reef). The following discussion highlights the results of the RME deterministic risk evaluation and the 95th percentile risks from the probabilistic distributions.

The carcinogenic risks were 1 x 10^{-7} (estimated deterministically) and 5 x 10^{-8} (estimated probabilistically) for the long-term ingestion of White Grunt from the reference reef. These risks were below the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.01 (estimated deterministically) and 0.006 (estimated probabilistically) for the ingestion of White Grunt from the reference reef. These hazards were acceptable because they were below the hazard index of unity (1).

The carcinogenic risks were 1 x 10^{-5} (estimated deterministically) and 3 x 10^{-6} (estimated probabilistically) for the long-term ingestion of White Grunt from the target reef. These risks were within the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.9 (estimated deterministically) and 0.47 (estimated probabilistically) for the long-term ingestion of White Grunt from the target reef. These hazards were acceptable because they were below the hazard index of unity (1).

The carcinogenic risks were 2 x 10^{-7} (estimated deterministically) and 6 x 10^{-8} (estimated probabilistically) for the long-term ingestion of Black Sea Bass from the reference reef. These risks were below the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.02 (estimated deterministically) and 0.008 (estimated probabilistically) for the ingestion of Black Sea Bass from the reference reef. These hazards were acceptable because they were below the hazard index of unity (1).

The carcinogenic risks were 1 x 10^{-6} (estimated deterministically) and 4 x 10^{-7} (estimated probabilistically) for the long-term ingestion of Black Sea Bass from the target reef. These risks were within or below the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.1 (estimated deterministically) and 0.05 (estimated probabilistically) for the long-term ingestion of Black Sea Bass from the target reef. These hazards were acceptable because they were below the hazard index of unity (1).

The carcinogenic risks were 2 x 10^{-7} (estimated deterministically) and 6 x 10^{-8} (estimated probabilistically) for the long-term ingestion of Vermilion Snapper from the reference reef. These risks were below the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.02 (estimated deterministically) and 0.008 (estimated probabilistically) for the ingestion of Vermilion Snapper from the reference reef. These hazards were acceptable because they were below the hazard index of unity (1).

The carcinogenic risks were 4 x 10^{-7} (estimated deterministically) and 2 x 10^{-7} (estimated probabilistically) for the long-term ingestion of Vermilion Snapper from the target reef. These risks are below the EPA's acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}. The non-carcinogenic hazards were 0.04 (estimated deterministically) and 0.02 (estimated probabilistically) for the long-term ingestion of Vermilion Snapper from the target reef. These hazards were acceptable because they were below the hazard index of unity (1). The uncertainties associated with the risk assessment are identified below:

- Chemical Data. Data validation indicated that the data are considered of sufficient quality, as qualified during validation, for use in risk assessment. The sample populations from the combined sampling and analysis rounds (at least 20 samples of each species collected over each reef with 11 samples of Black Sea Bass collected over the target reef) were considered adequately representative of the background (reference) and target (site) conditions. The supplemental analysis round confirmed the supposition that the lipid and PCB concentration distributions observed in the first round of analyses were not an artifact of the analytical or preparative procedures.
- Exposure Assessment. The RME risks and hazards, calculated using the respective IRIS slope factor and reference dose, represent the high-end potential for the occurrence of cancer and non-cancer effects. They were based on high-end exposure point concentrations of PCBs in fish, and a number of exposure parameters, such as exposure duration and fish ingestion rate. It should be noted that the average risks and exposures based on central tendency values for the exposure parameters were many times lower. Another area of uncertainty is the FI term that represents the fraction of marine finfish intake that may potentially be contaminated with PCBs from the artificial reef. In assessing exposure in this HHRA, the FI value of 0.1 was assumed in the draft HHRA (NEHC 2002). In this final HHRA, in addition to 0.1, the values of 0.11 (RME) and 0.14 (CTE) were also used to characterize risks and hazards (NEHC 2003c and 2003d). Despite this approach to evaluate uncertainty, it should be noted that the FI term values were specific to the ex-VERMILLION reef. These values may not be applicable in exposure scenarios where the exposed population (marine anglers) also fish and ingest finfish from other artificial reefs that could contain residual PCBs.
- Toxicity Assessment. To be conservative, the lower of two reference doses (Aroclor 1016 and Aroclor 1254) available on IRIS was used in the HHRA. This RfD was applicable to Arochlor 1254. IRIS indicates that the uncertainty factor for this RfD is 300, and the level of confidence is medium. The use of this conservative RfD had resulted in higher hazards than those hazards derived with the higher (less conservative) RfD. Weathering of PCBs in the marine environment is expected, resulting in the PCB composition in the fish tissue being different from the fresh PCB used in the toxicity testing. Further, the total PCBs in fish were accurately measured, which were based on the sum of ten PCB homologue groups. The potential non-carcinogenic hazard from each homologue group, e.g., total trichlorobiphenyls, was assumed to be equivalent to the fresh PCB mixture (Aroclor 1254). While the use of the RfD for PCB 1254 may not reflect the actual mixture that was present, it should provide a conservative estimate of hazard, since it is the lower of the two available reference doses. Finally, the RfD has a built-in uncertainty factor of 300, which provides additional conservatism to the toxicity value.

  Similarly, for the carcinogenic slope factor, the value was also conservatively derived based on the 95% confidence level. PCB is classified as a B2 carcinogen that is based on limited human data and sufficient animal data. In other word, the human health carcinogenic concern is tentative. Concerning the use of TEQ and OPPT total toxicity factor in the HHRA, it can only be said that these approach or value has not gone through the formal EPA review process and published on IRIS. Use of toxicity values that have not undergone the same level of scrutiny and approval as the values presented in IRIS adds an additional degree of uncertainty to the conclusions.

- Risk Characterization. The risk characterization methodology followed was in accordance with EPA guidance (EPA 1989a and 1995a). This risk characterization method is widely accepted by the risk assessment community and the EPA program offices. The method is simple to use; however, it can be highly conservative, if the RME approach is followed. Therefore, EPA encourages the development of additional risk characterization results or risk descriptors that include the presentations of average and probabilistic risk and hazard (EPA 1992a). These descriptors were presented in this report. Nonetheless, the risk characterization methodology also has its limitations, which is expected for any simple model to predict risk outcomes from exposure input. These limitations and assumptions include: (1) that the dose response remains linear at chronic low dose exposure, and therefore, the adverse effect or incidence of tumor is directly proportional to the average daily intake over a lifetime, (2) that any exposure will cause an effect regardless of dose, (3) that pharmacokinetic effects are not considered (effects such as body burden, metabolism, and excretion could impact the toxic effect of PCBs on humans), (4) that antagonistic and potentiation by the presence of other chemicals or dietary intake on the toxic effects of PCBs does not occur, and (5) that genetic predisposition to the toxic effects of PCBs is not a consideration for the exposed population. Finally, it should be noted that total PCBs were quantified based on homologue analyses, and not based on Aroclor. The toxicity values provided in IRIS were based on Aroclor (fresh). While quantitation of total PCBs in this study is more accurate and accounts for all PCBs, the quantitation is expected to be more conservative than quantitation based on Aroclors.

  The uncertainty of the FI term is acknowledged and documented in NEHC 2003c and 2003d, and the risks and hazards associated with the uncertainty are also characterized and summarized in Tables 5-4 through 5-9. Based on these results, it can be concluded that the impact is relatively small for using an FI Term of 0.1 for both the RME and CTE evaluations (NEHC 2002) vs. the values of 0.14 for CTE and 0.11 for RME in this final HHRA. The angler survey data (Hammond et. al. 2003) support the FI Term of 0.1 used in the draft HHRA; minor difference between the various values (i.e., those recommended by EPA) would not have any significant impact on the conclusions of the HHRA. That is, within the limitations and uncertainties of the FI term, the HHRA would demonstrate no unacceptable risk or hazard. Overall, the risk characterization results based on this study are likely to be more conservative.

In conclusion, the chemical data showed that the PCBs in fish caught at the target reef were higher than the reference reef, particularly for the White Grunt. However, none of the RME and average risks and hazards, estimated deterministically or probabilistically, show exceedances for the ingestion of the White Grunt, Black Sea Bass or Vermilion Snapper caught at the reference and target reefs. Although PCBs aboard the ex-VERMILLION may be contributing to elevated PCB levels in fish at the target reef, PCB contamination at the reef is unlikely to pose a significant health risk to the sports fisherman from ingestion of the predominant sports fish species (White Grunt, Black Sea Bass or Vermilion Snapper) found at the target reef.

As identified in section 3.1, one of the primary goals of the risk assessment was to answer the following two risk management questions:

- *Is it likely that the sinking of former Navy vessels containing PCB-containing materials will pose an unacceptable risk to human health or the environment?*

- *How much PCB residue can remain on former Navy vessels used for building artificial reefs without resulting in an unacceptable risk?*

Based on the results of the Human Health and Ecological Risk Assessments for the ex-VERMILLION, it is unlikely that the sinking of other former Navy vessels containing PCB-containing materials to create artificial reef environments will pose an unacceptable risk as long as the following two conditions are true:

1) The ship is mitigated (removal of PCB-containing materials) to the same degree or more compared to the target reef (ex-VERMILLION) and,

2) The exposure scenario is similar to that found at the target reef (the ex-VERMILLION).

The question of how much PCB residue can safely remain onboard former Navy vessels used for artificial reef construction can be addressed by the Prospective Risk Assessment Model (PRAM) that is currently under development.

Based on the outcome of this human health risk assessment and the finding that the ecological risk assessment does not show an unacceptable risk for the ex-VERMILLION, the EPA/Navy have several options for risk management in the future construction of artificial reefs from ex-Navy vessels:

- EPA could allow States to use sunken Navy vessels for creating artificial reefs based on this report and the results of the ecological risk assessment.
- EPA could allow States to use sunken Navy vessels for creating artificial reefs based on this report and the results of the ecological risk assessment along with future results of the Prospective Risk Assessment Model.
- A test vessel with known PCB loading may be sunk and monitored for the release of PCBs from that ship for some defined time period.

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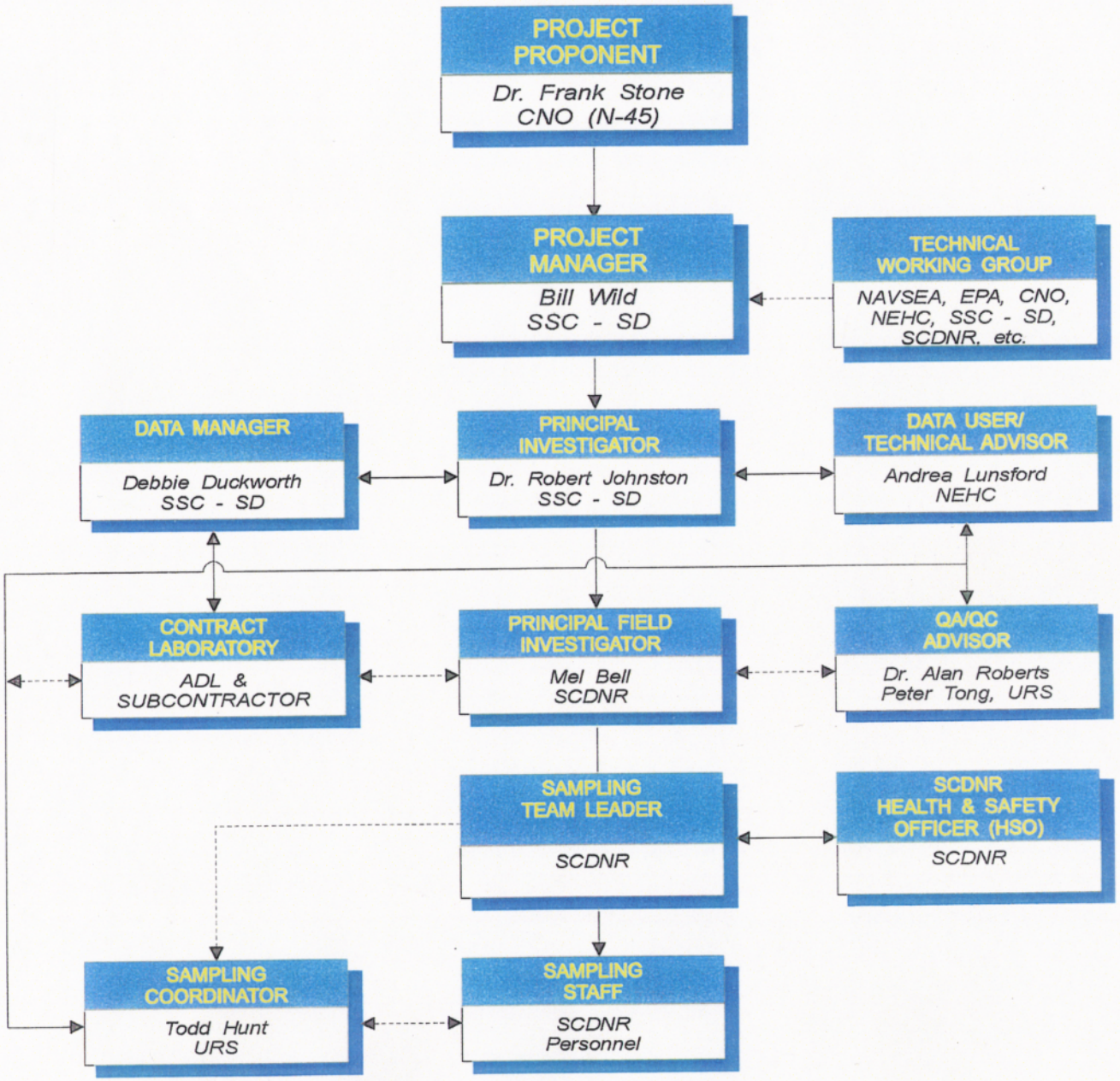
Figu[illegible]2-1

PROJECT ORGANIZATION CHART



S:\JCG\FIG2-1.CDR

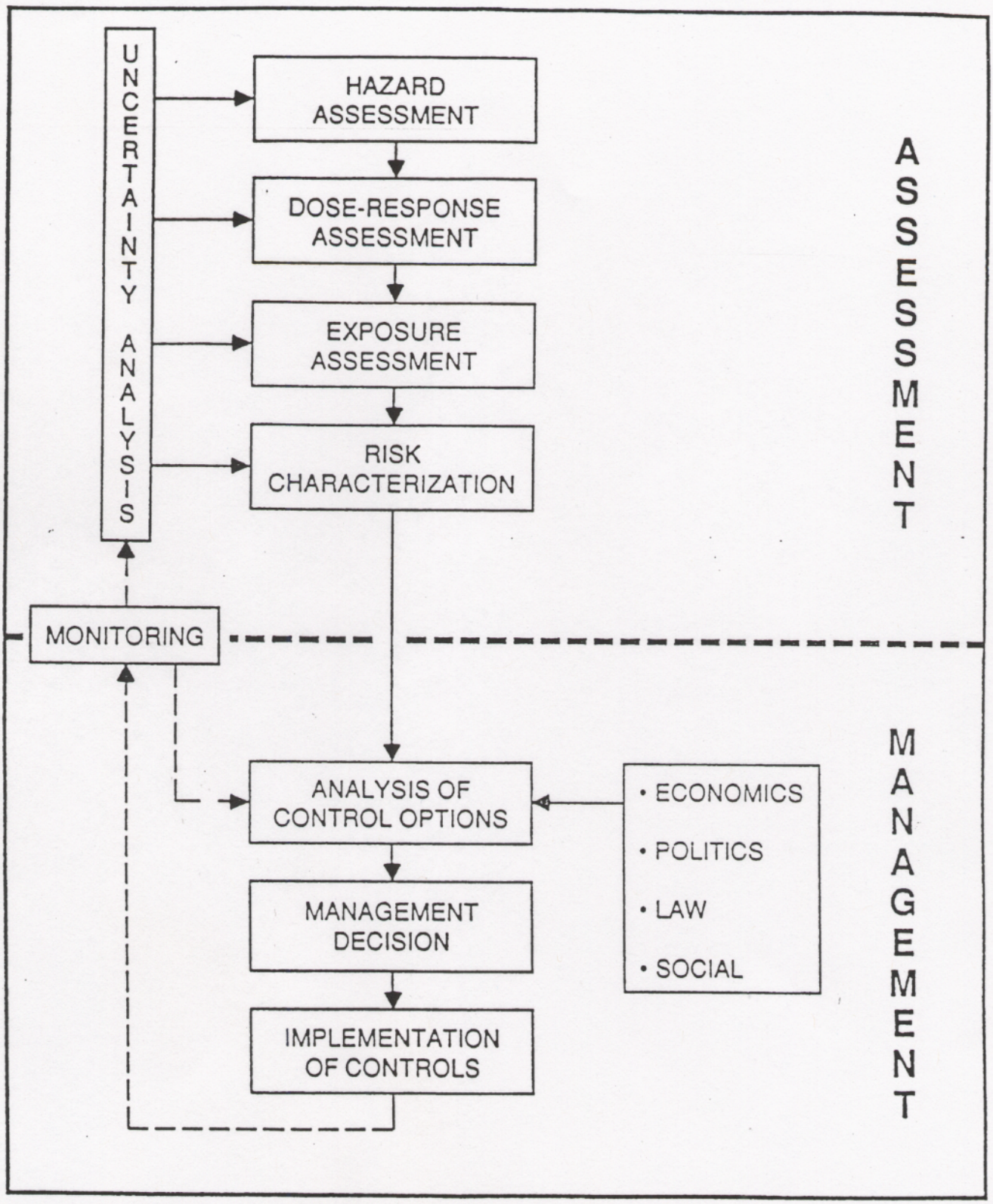
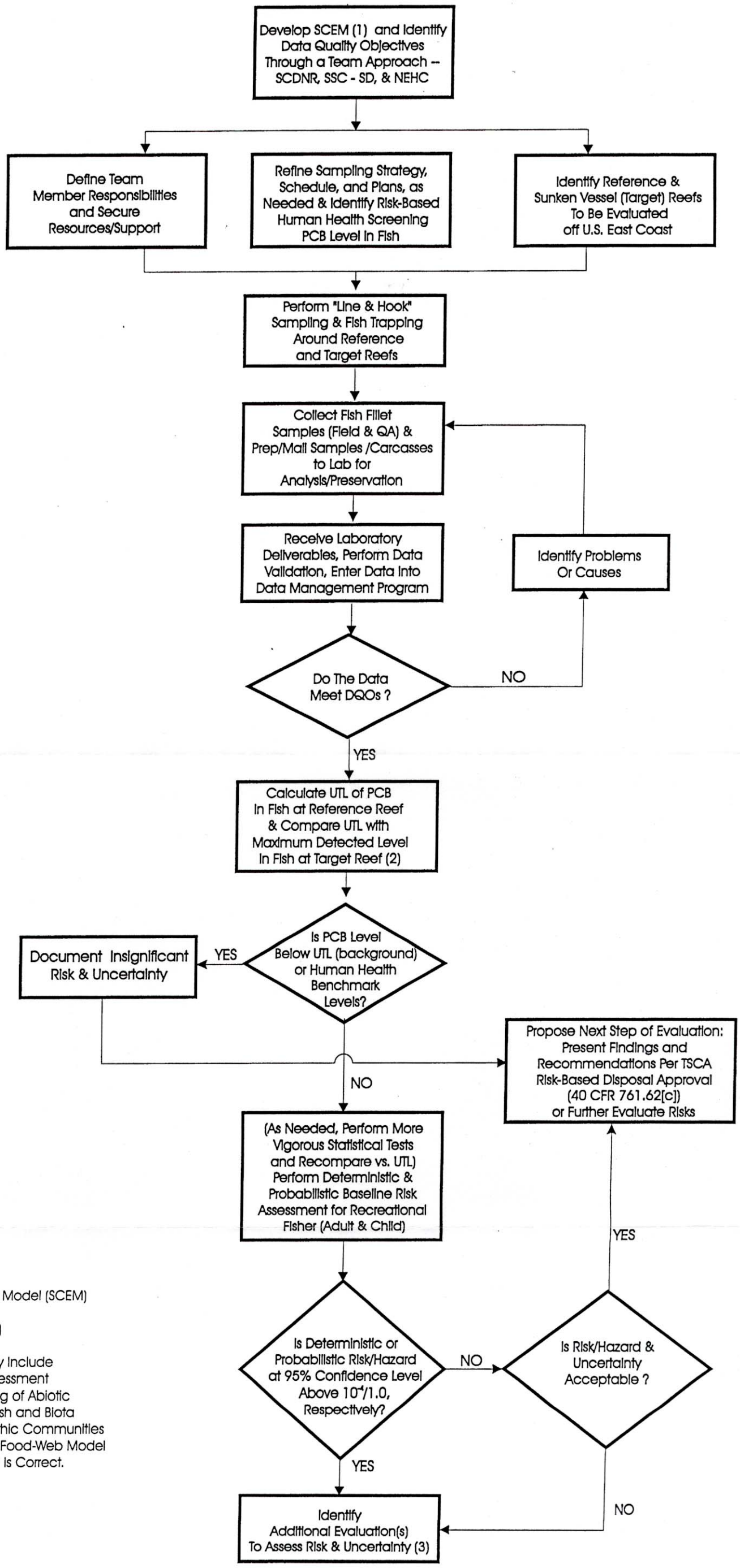


Figure 3-1 Overview of risk assessment and risk management

Source: *Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish: A Guidance Manual.* Office of Water Regulations and Standards, EPA, Washington, DC. EPA Publication No.: EPA-503/8-89-002. December 1989.

Figure 4-1
PROJECT STRATEGY/ DECISION FLOW



Notes:

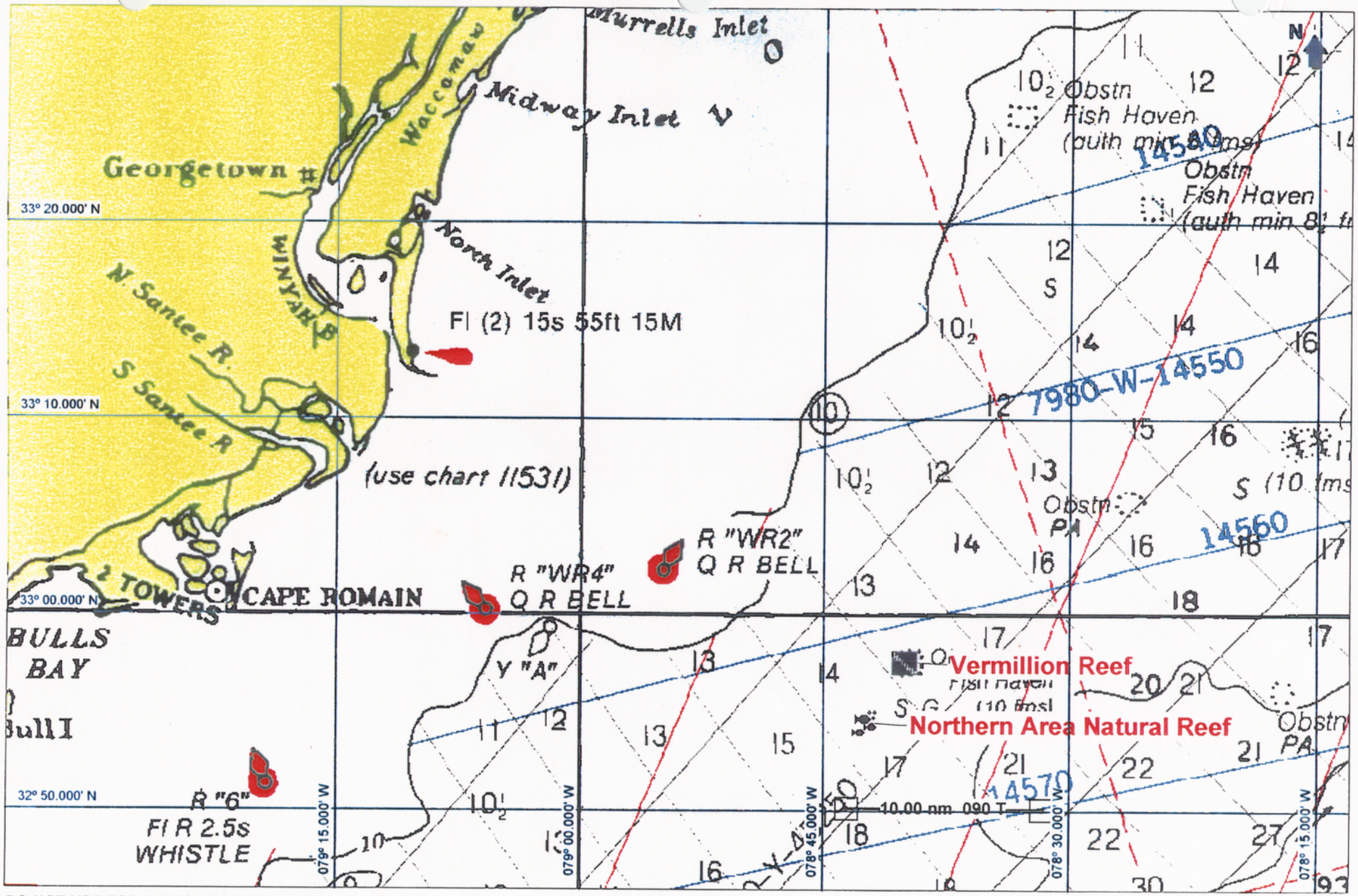
(1) Site Conceptual Exposure Model (SCEM)

(2) Upper Tolerance Limit (UTL)

(3) Additional Evaluations May Include Refinement of the Risk Assessment Assumptions, and Sampling of Abiotic Media and Additional Finfish and Biota in the Benthic and Epibenthic Communities to Determine Whether the Food-Web Model as Delineated in the SCEM is Correct.

S:\JCG\FIGURE4-1.CDR

CAPE HATTERAS TO STRAITS OF FLORIDA
Chart 11009_1 3 Electronic Charts) Depth Units: FATHOMS

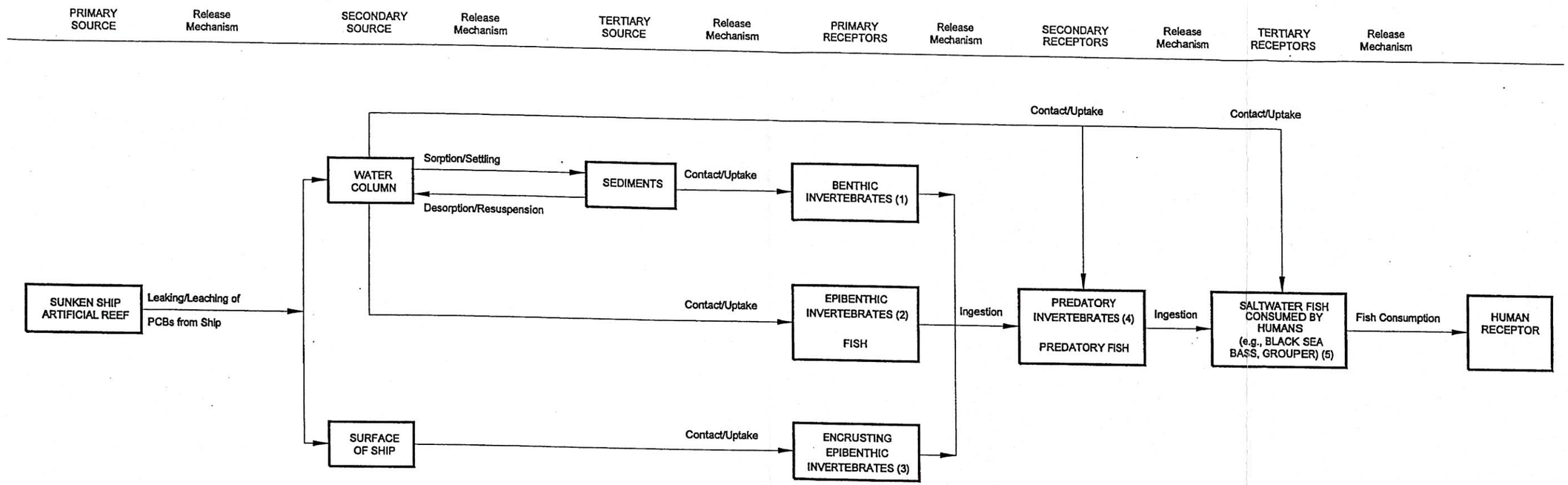


DO NOT USE FOR NAVIGATION PURPOSES

FIGURE 4-2

Figure 5-1

SITE CONCEPTUAL EXPOSURE MODEL



(1) Benthic invertebrates are infaunal organisms such as amphipod.

(2) Includes but is not limited to filter-feeding invertebrates, such as mollusks (clams and oysters), tunicates, sponges, annelids (tube worms and free-living worms), sea fans (gorgonians), as well as non-filter-feeding invertebrates such as hydroids, anemones, crustaceans (lobster), echinoderms (brittle stars, sea urchins, and sea cucumbers), and mollusks (octopi and squids).

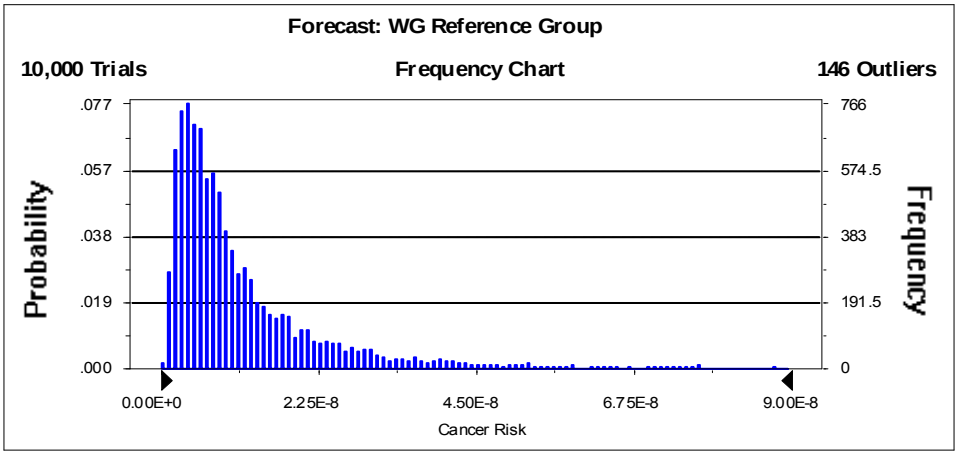
(3) Encrusting organisms attached to the ship's surface including but not limited to mollusks (clams and oysters), tunicates, sponges, tube worms, hydroids, sea fans (gorgonians), as well as non-filter-feeding invertebrates such as anemones and sea urchins.

(4) Includes crustaceans, anemones, echinoderms, and mollusks (octopi and squids).

(5) Black Sea Bass and Grouper may eat a variety of organisms including crustaceans, echinoderms, squids, octopi, worms, and fish that live in or near the bottom mud and clay substrates.

Figure 5-2
Risk Evaluation for Consumption of White Grunt
Probabilistic Cancer Risk of Total PCBs
Navy REEFEX Program

White Grunt - Reference Reef: (95^{th} percentile: 4.63×10^{-8}, 50^{th} percentile: 8.17×10^{-9})



White Grunt - Target Reef: (95^{th} percentile: 3.45×10^{-6}, 50^{th} percentile: 7.38×10^{-7})

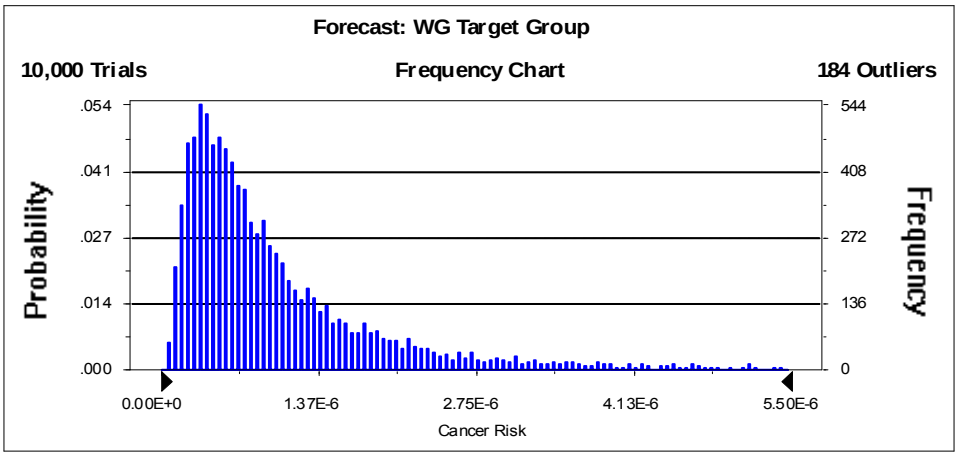
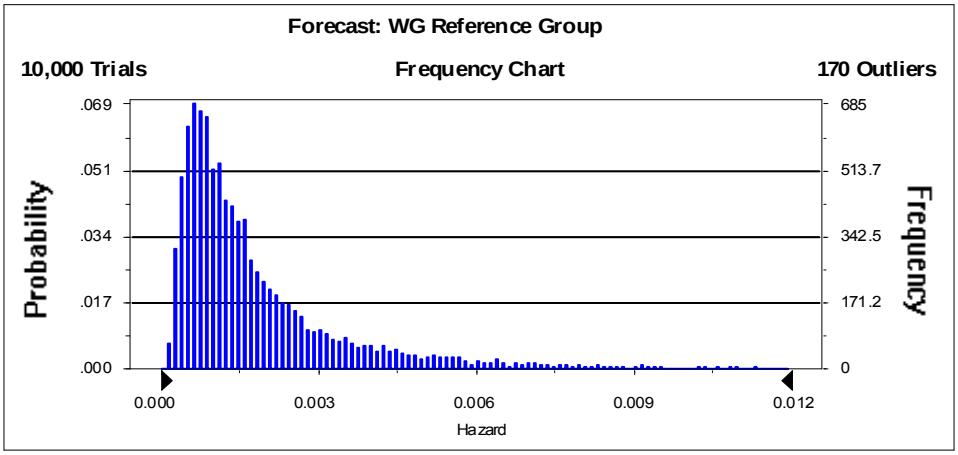


Figure 5-3
Risk Evaluation for Consumption of White Grunt
Probabilistic Hazard of Total PCBs
Navy REEFEX Program

White Grunt - Reference Reef: (95th percentile: 0.006, 50th percentile: 0.001)



White Grunt - Target Reef: (95th percentile: 0.47, 50th percentile: 0.12)

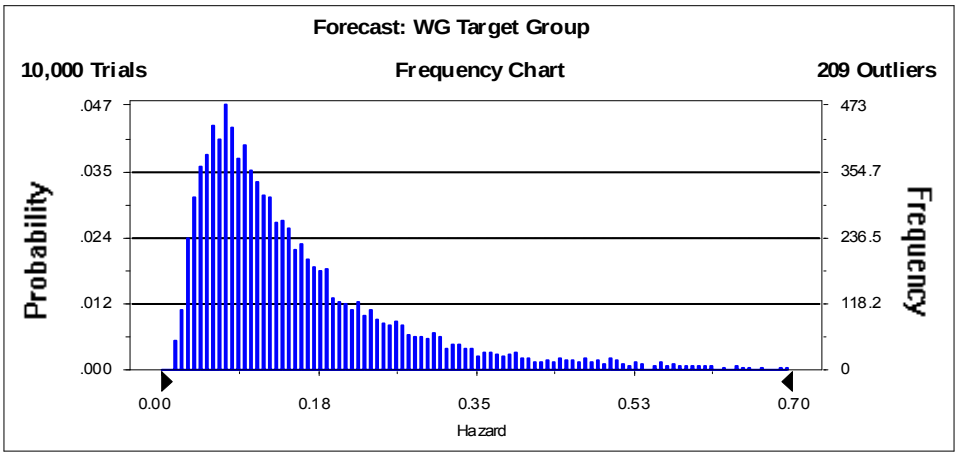
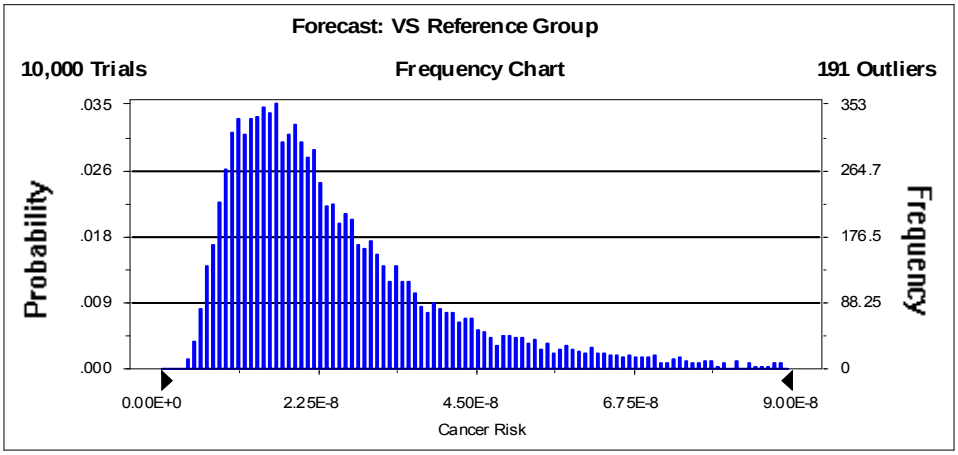


Figure 5-4
Risk Evaluation for Consumption of Vermilion Snapper
Probabilistic Cancer Risk of Total PCBs
Navy REEFEX Program

Vermilion Snapper - Reference Reef: (95^{th} percentile: 6.43×10^{-8}, 50^{th} percentile: 2.12×10^{-8})



Vermilion Snapper - Target Reef: (95^{th} percentile: 1.55×10^{-7}, 50^{th} percentile: 4.14×10^{-8})

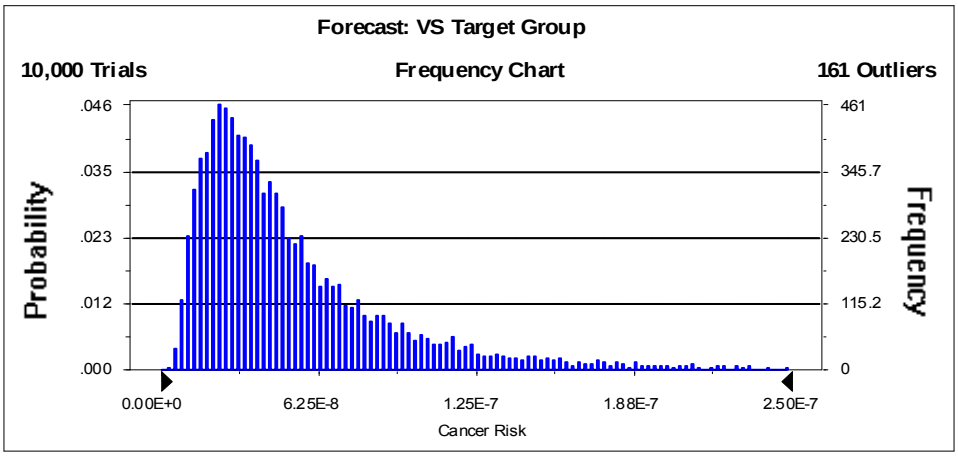
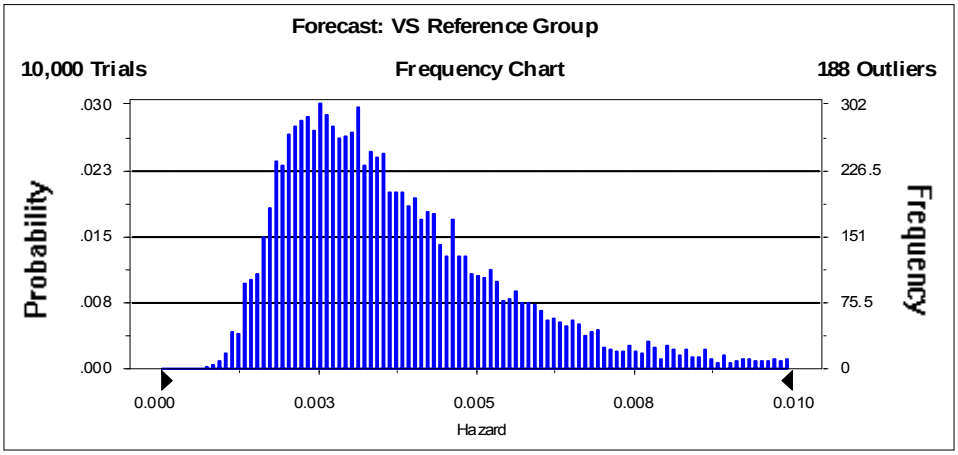


Figure 5-5
Risk Evaluation for Consumption of Vermilion Snapper
Probabilistic Hazard of Total PCBs
Navy REEFEX Program

Vermilion Snapper - Reference Reef: (95th percentile: 0.008, 50th percentile: 0.003)



Vermilion Snapper - Target Reef: (95th percentile: 0.02, 50th percentile: 0.007)

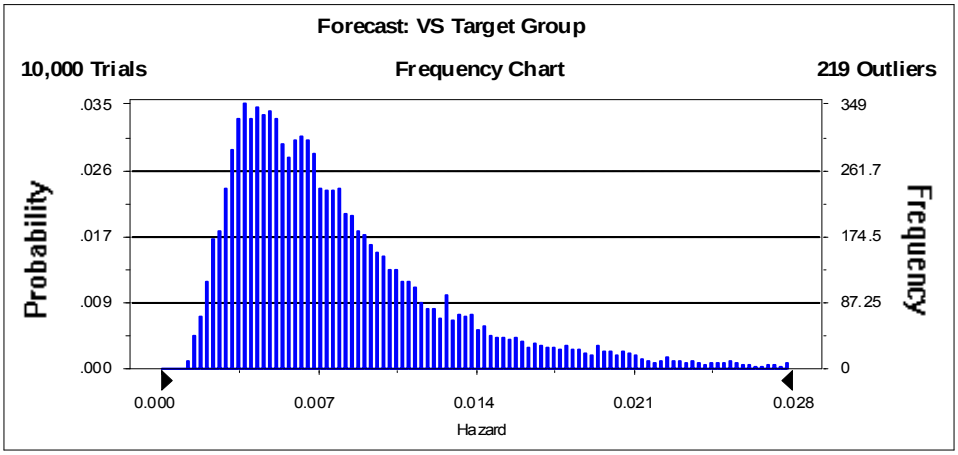
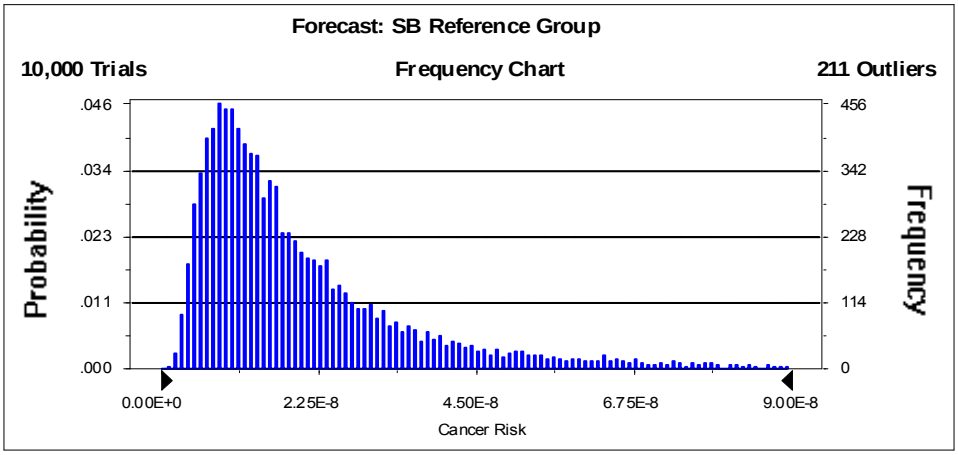


Figure 5-6
Risk Evaluation for Consumption of Black Sea Bass
Probabilistic Cancer Risk of Total PCBs
Navy REEFEX Program

Black Sea Bass - Reference Reef: (95^{th} percentile: 6.30×10^{-8}, 50^{th} percentile: 1.55×10^{-8})



Black Sea Bass - Target Reef: (95^{th} percentile: 3.92×10^{-7}, 50^{th} percentile: 1.17×10^{-7})

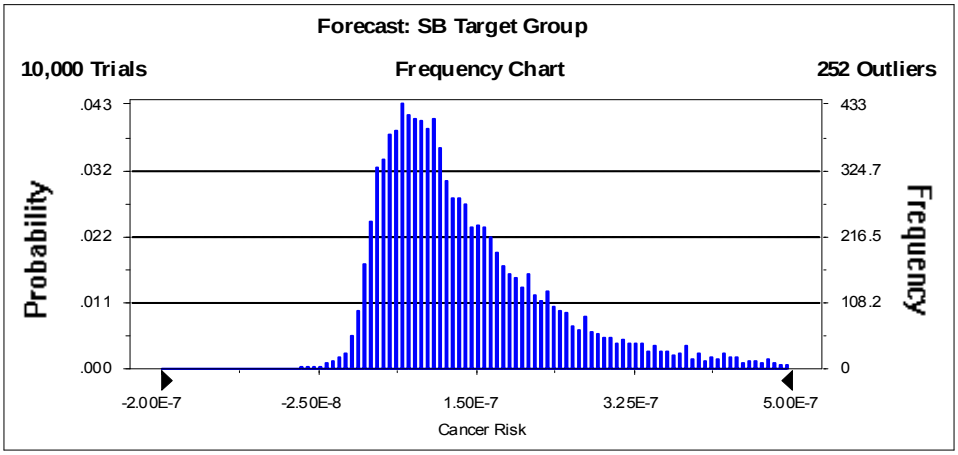
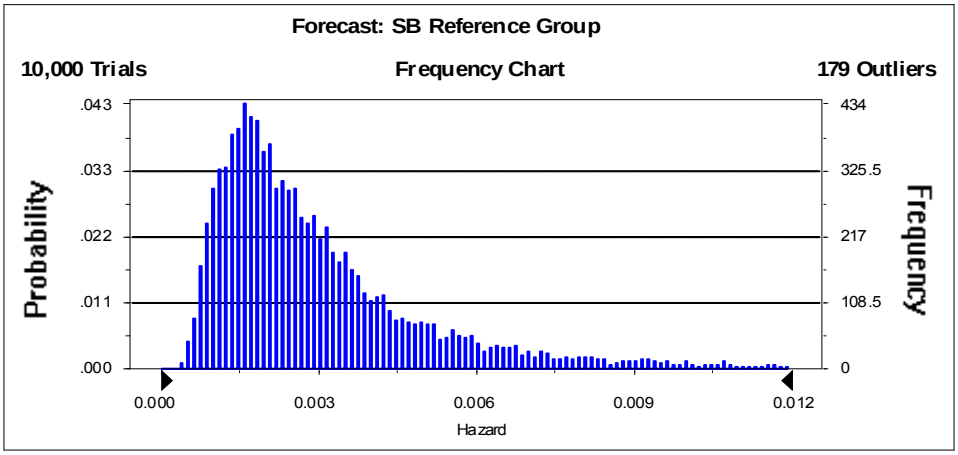


Figure 5-7
Risk Evaluation for Consumption of Black Sea Bass
Probabilistic Hazard of Total PCBs
Navy REEFEX Program

Black Sea Bass - Reference Reef: (95th percentile: 0.008, 50th percentile: 0.002)



Black Sea Bass - Target Reef: (95th percentile: 0.05, 50th percentile: 0.02)

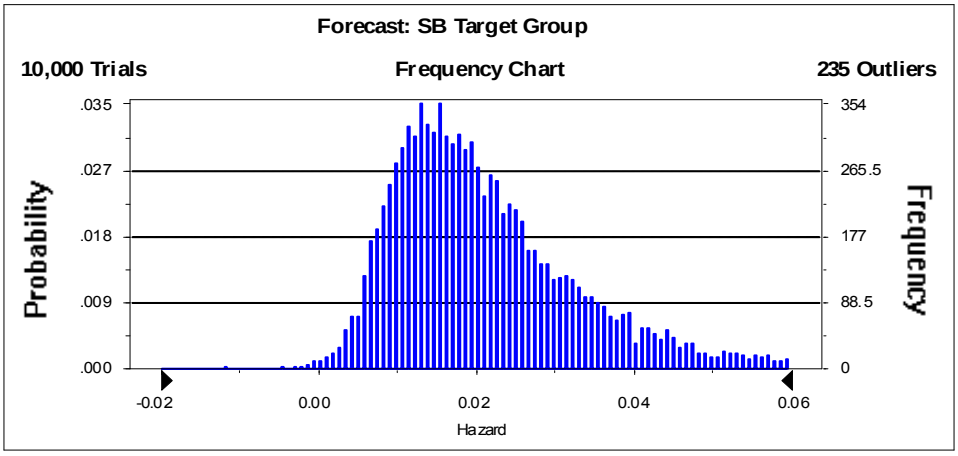
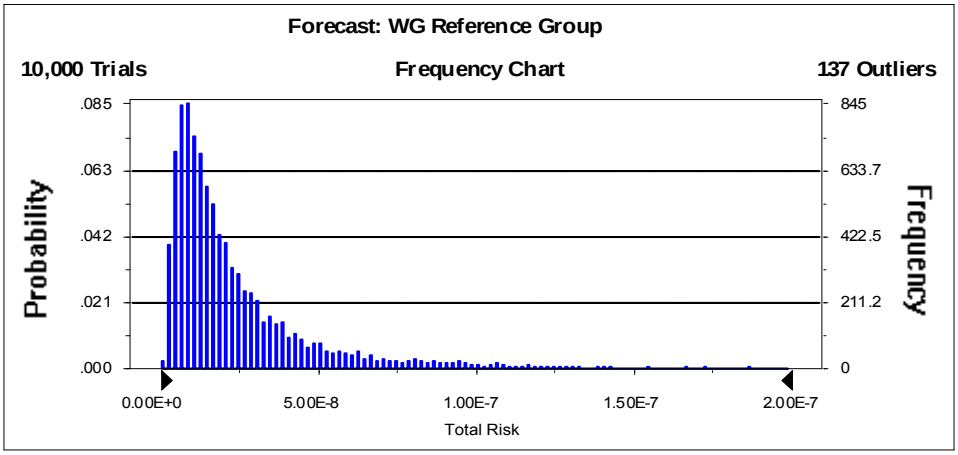


Figure 5-8
Risk Evaluation for Consumption of White Grunt
Combined Probabilistic Risk and Hazard of Total PCBs
Navy REEFEX Program

White Grunt - Reference Reef: (95^{th} percentile: $9.79x10^{-8}$, 50^{th} percentile: $1.65x10^{-8}$)



White Grunt - Target Reef: (95^{th} percentile: $6.94x10^{-6}$, 50^{th} percentile: $1.50x10^{-6}$)

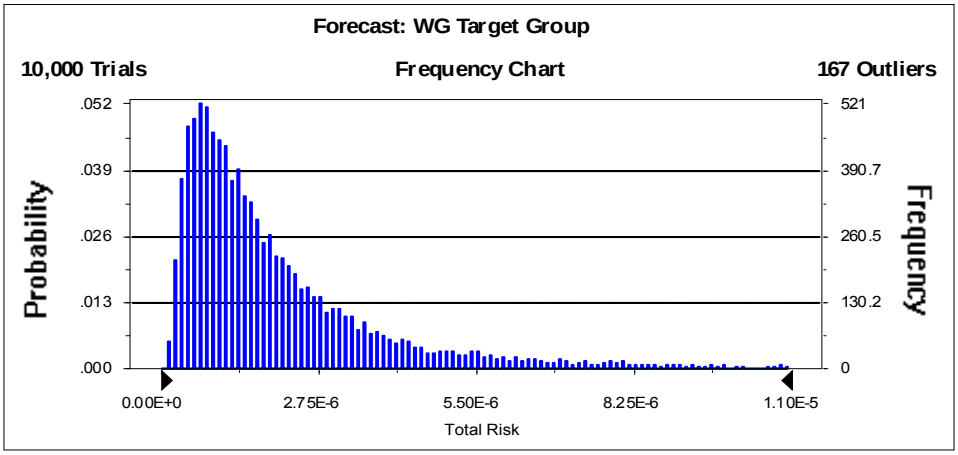
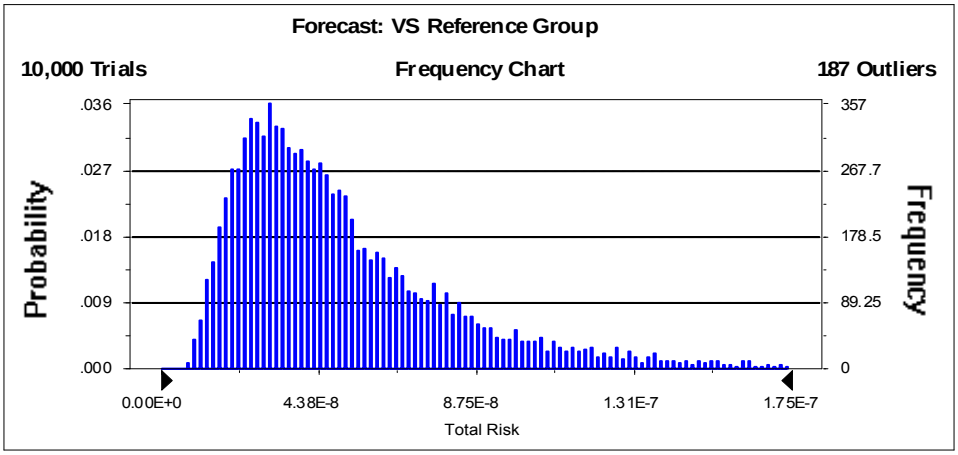


Figure 5-9
Risk Evaluation for Consumption of Vermilion Snapper
Combined Probabilistic Risk and Hazard of Total PCBs
Navy REEFEX Program

Vermilion Snapper - Reference Reef: (95^{th} percentile: 1.25×10^{-7}, 50^{th} percentile: 4.32×10^{-8})



Vermilion Snapper - Target Reef: (95^{th} percentile: 3.07×10^{-7}, 50^{th} percentile: 8.07×10^{-8})

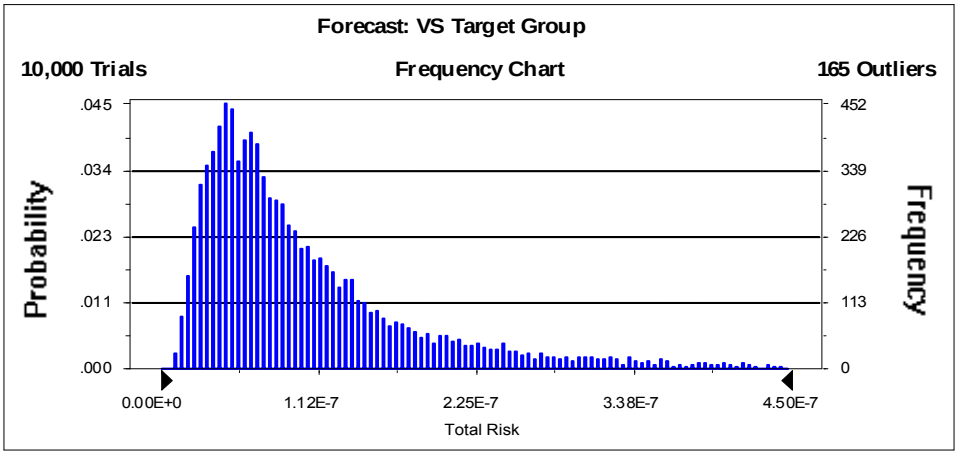
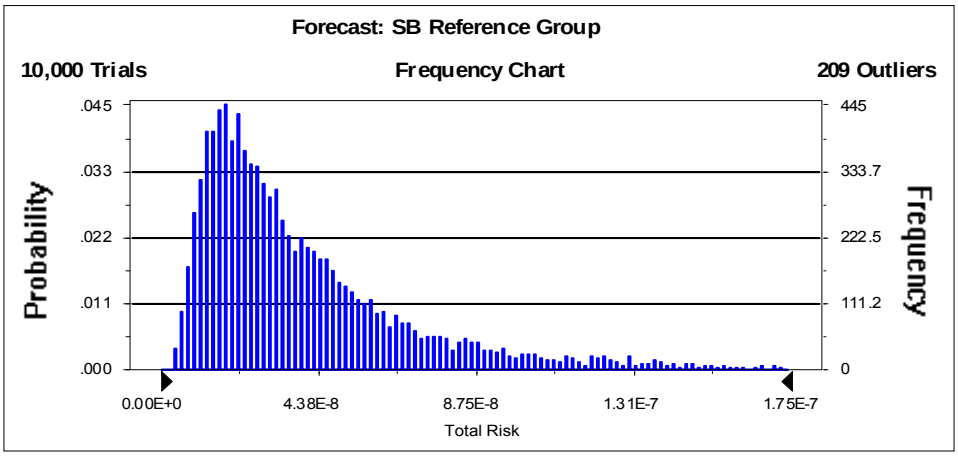


Figure 5-10
Risk Evaluation for Consumption of Black Sea Bass
Combined Probabilistic Risk and Hazard of Total PCBs
Navy REEFEX Program

Black Sea Bass - Reference Reef: (95th percentile: 1.21x10^{-7}, 50th percentile: 3.11x10^{-8})



Black Sea Bass - Target Reef: (95th percentile: 7.90x10^{-7}, 50th percentile: 2.35x10^{-7})

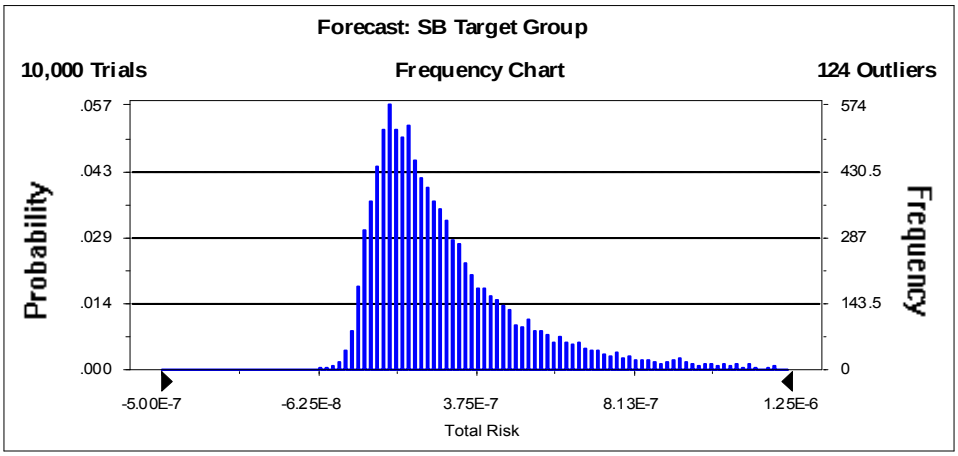


Table 1-1
Summary of Deterministic and Probabilistic Risks and Hazards Based on the FI Term of 0.1
(Used for both RME and CTE [July 02 Draft HRA]) -
Consumption of Fish Caught at Reference and Target Reefs

White Grunt	**Reference Reef**	**Target Reef**
RME Risk - Total PCB/IRIS Slope Factors	1E-07	1E-05
RME Hazard - Total PCB/IRIS RfD	0.01	0.9
RME Risk/Hazard - Total PCB/Total Toxicity Factor	3E-07	2E-05
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	6E-07	2E-05
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.2
Average Risk - Total PCB/IRIS Slope Factors	1E-08	8E-07
Average Hazard - Total PCB/IRIS RfD	0.002	0.2
Average Risk/Hazard - Total PCB/Total Toxicity Factor	2E-08	2E-06
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	4E-08	2E-06
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0006	0.04
Probabilistic Risk - Total PCB/IRIS Slope Factors; 95% Confidence Interval	5E-08	3E-06
Probabilistic Risk - Total PCB/IRIS Slope Factors; 50% Confidence Interval	8E-09	7E-07
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 95% Confidence Interval	0.006	0.47
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 50% Confidence Interval	0.001	0.12
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 95% Confidence Interval	1E-07	7E-06
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 50% Confidence Interval	2E-08	2E-06

Vermilion Snapper		
RME Risk - Total PCB/IRIS Slope Factors	2E-07	4E-07
RME Hazard - Total PCB/IRIS RfD	0.02	0.04
RME Risk/Hazard - Total PCB/Total Toxicity Factor	4E-07	8E-07
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	8E-07	1E-06
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.007
Average Risk - Total PCB/IRIS Slope Factors	2E-08	4E-08
Average Hazard - Total PCB/IRIS RfD	0.004	0.008
Average Risk/Hazard - Total PCB/Total Toxicity Factor	3E-08	7E-08
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	8E-08	1E-07
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0007	0.001
Probabilistic Risk - Total PCB/IRIS Slope Factors; 95% Confidence Interval	6E-08	2E-07
Probabilistic Risk - Total PCB/IRIS Slope Factors; 50% Confidence Interval	2E-08	4E-08
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 95% Confidence Interval	0.008	0.02
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 50% Confidence Interval	0.003	0.007
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 95% Confidence Interval	1E-07	3E-07
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 50% Confidence Interval	4E-08	8E-08

Black Sea Bass		
RME Risk - Total PCB/IRIS Slope Factors	2E-07	1E-06
RME Hazard - Total PCB/IRIS RfD	0.02	0.1
RME Risk/Hazard - Total PCB/Total Toxicity Factor	4E-07	2E-06
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	7E-07	4E-06
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.02
Average Risk - Total PCB/IRIS Slope Factors	1E-08	1E-07
Average Hazard - Total PCB/IRIS RfD	0.003	0.02
Average Risk/Hazard - Total PCB/Total Toxicity Factor	3E-08	2E-07
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	6E-08	3E-07
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0006	0.004
Probabilistic Risk - Total PCB/IRIS Slope Factors; 95% Confidence Interval	6E-08	4E-07
Probabilistic Risk - Total PCB/IRIS Slope Factors; 50% Confidence Interval	2E-08	1E-07
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 95% Confidence Interval	0.008	0.05
Probabilistic Hazard - Total PCB/IRIS Slope Factors; 50% Confidence Interval	0.002	0.02
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 95% Confidence Interval	1E-07	8E-07
Probabilistic Risk & Hazard - Total PCB/Total Toxicity Factor; 50% Confidence Interval	3E-08	2E-07

Table 1-2
Summary of Deterministic Risks and Hazards
Based on the FI Term of 0.11(RME) and 0.14 (CTE) as Recommended by EPA (Versar 2003b) -
Consumption of Fish Caught at Reference and Target Reefs

White Grunt	FI = 0.1 Reference Reef	FI = 0.11(RME), 0.14 (CTE) Reference Reef	FI = 0.1 Target Reef	FI = 0.11(RME), 0.14 (CTE) Target Reef
RME Risk - Total PCB/IRIS Slope Factors	1E-07	2E-07	1E-05	1E-05
RME Hazard - Total PCB/IRIS RfD	0.01	0.01	0.9	1
RME Risk/Hazard - Total PCB/Total Toxicity Factor	3E-07	3E-07	2E-05	2E-05
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	6E-07	7E-07	2E-05	2E-05
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.003	0.2	0.2
Average Risk - Total PCB/IRIS Slope Factors	1E-08	1E-08	8E-07	1E-06
Average Hazard - Total PCB/IRIS RfD	0.002	0.003	0.2	0.3
Average Risk/Hazard - Total PCB/Total Toxicity Factor	2E-08	3E-08	2E-06	2E-06
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	4E-08	6E-08	2E-06	3E-06
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0006	0.0008	0.04	0.06
Black Sea Bass				
RME Risk - Total PCB/IRIS Slope Factors	2E-07	2E-07	1E-06	1E-06
RME Hazard - Total PCB/IRIS RfD	0.02	0.02	0.1	0.1
RME Risk/Hazard - Total PCB/Total Toxicity Factor	4E-07	4E-07	2E-06	3E-06
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	7E-07	8E-07	4E-06	5E-06
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.003	0.02	0.02
Average Risk - Total PCB/IRIS Slope Factors	1E-08	2E-08	1E-07	1E-07
Average Hazard - Total PCB/IRIS RfD	0.003	0.004	0.02	0.03
Average Risk/Hazard - Total PCB/Total Toxicity Factor	3E-08	4E-08	2E-07	3E-07
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	6E-08	9E-08	3E-07	4E-07
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0006	0.0009	0.004	0.006
Vermilion Snapper				
RME Risk - Total PCB/IRIS Slope Factors	2E-07	2E-07	4E-07	5E-07
RME Hazard - Total PCB/IRIS RfD	0.02	0.02	0.04	0.04
RME Risk/Hazard - Total PCB/Total Toxicity Factor	4E-07	4E-07	8E-07	9E-07
RME Risk - 13 Dioxin-like Congeners/WHO Relative Potency Factors	8E-07	9E-07	1E-06	1E-06
RME Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.003	0.003	0.007	0.008
Average Risk - Total PCB/IRIS Slope Factors	2E-08	2E-08	4E-08	5E-08
Average Hazard - Total PCB/IRIS RfD	0.004	0.006	0.008	0.011
Average Risk/Hazard - Total PCB/Total Toxicity Factor	3E-08	5E-08	7E-08	1E-07
Average Risk - 13 Dioxin-like Congeners/Relative Potency Factors	8E-08	1E-07	1E-07	2E-07
Average Hazard - 13 Dioxin-like Congeners/IRIS RfD	0.0007	0.0010	0.001	0.002

Note:
CTE - Same as Average (risks or hazards associated with average exposure)

Table 1-3
Summary of Revisions - Revisions Made on the Draft HHRA (NEHC 2002) in Order to Finalize the HHRA

LOCATION	DESCRIPTION	REVISIONS
Cover Page and Spine	Address and Date of Publication	NEHC address has been revised, and so is the date of publication of this Final Draft HHRA.
Table of Contents	List of Tables	Re-title Table 1-1 to reflect risk characterization results for the draft HHRA (FI Term was 0.1). Add Table 1-2 to present summary risk characterization results for the deterministic hazards and risks based on EPA recommended FI term values (Versar 2003b). Add Table 1-3 (this table) that identifies revisions made.
Table of Contents	List of Appendices	Add Appendix H (NEHC 05 Sep 03 response to EPA comments on the derivation of FI term (NEHC 2003b). Add Appendix I (NEHC 15 Nov 03 response to EPA comments on the revised FI term derivation (NEHC 2003e). Add Appendix J "Revised Derivation of a Fraction Ingested [FI] Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina" [URS, September 5, 2003]).
Executive Summary	4th paragraph, page 1-1	This paragraph has been added to describe the fish consumption survey, EPA comments on the survey data and the derivation of the FI term, the Navy responses to the EPA comments, culminating in finalization of the HHRA.
Executive Summary	4th paragraph, page 1-3, and 1st and 2nd paragraph, page 1-4	These paragraphs have been added to summarize Navy responses to the EPA comments on the FI term. Specifically, they describe that the EPA recommended FI term values for the RME and CTE have been incorporated in finalizing the HHRA.
Section 2.4, Technical Working Group	Bullets 10 and 11, page 2-3	Add the draft HHRA (NEHC 2002) and the FI derivation documents (NEHC 2003a, 2003c and 2003d) as data previously reviewed by the Technical Working Group (TWG). A footnote, explaining PRAM, has been added.
Section 2.6, Contents of the Risk Assessment Report	Bullets 1 and 5, page 2-4	Bullet 1 has been revised to identify several key tables that summarize risks and hazards, and key changes made on the draft HHRA to become the final HHRA. Bullet 5 has been revised to indicate that deterministic risks and hazards were calculated based on the assumed FI term value of 0.1 (draft HHRA) and EPA recommended FI term values of 0.11 (RME) and 0.14 (CTE). The NEHC Point of Contact, phone number and email address have been revised.
Section 5.1.1, Overview	2nd paragraph, page 5-1	This paragraph clarifies that the children (a more sensitive population than adults) were the receptor evaluated for non-cancer hazard as a conservative measure. For assessing carcinogenic risks, the combined childhood and adult exposure was used. The unit of measure for the children fish ingestion rates (IR_c) and adult fish ingestion rate (IR_a) have been revised to kg/day to be consistent with the calculations presented in Appendix F.
Section 5.2.3, Estimation of Exposure Point Concentrations	2nd paragraph, page 5-7	This new paragraph better explains that if the H or t-statistic approaches were deemed to be inappropriate, a non-parametric method (e.g., bootstrap or jackknife method) would be used to calculate exposure point concentrations. This approach was consistent with the EPA guidance and HHRA work plan.
Section 5.2.4, Identification of Exposure Parameters and Assumptions/Fish ingestion Rates for Children and Adults	1st and 2nd paragraph, page 5-9	In order to be consistent with Appendix F (Detailed Risk Assessment Worksheets), the mean and 95th percentile ingestion rates for children and adults have been revised to provide the unit of measure as kg/day.

Table 1-3
Summary of Revisions - Revisions Made on the Draft HHRA (NEHC 2002) in Order to Finalize the HHRA

LOCATION	DESCRIPTION	REVISIONS
Section 5.2.4, Identification of Exposure Parameters and Assumptions/Fraction of Fish Ingested (FI)	1st, 2nd, 3rd, 4th, and 5th paragraphs, page 5-10	A sentence has been added to the end of the first paragraph to indicate that the assumed FI term value of 0.1 was based on time spent or frequency of marine anglers at the ex-VERMILLION reef, not marine finfish consumption data. The 2nd and 3rd paragraphs have been added to give a chronology of effort and the resulting documents to support derivation of the FI term based on marine finfish consumption survey. The 4th paragraph was added to caution the applicability of the derived FI term values. Minor syntax changes were made for the 5th paragraph.
Section 5.2.4, Identification of Exposure Parameters and Assumptions/Exposure Duration for Adults (ED_a)	Last paragraph, page 5-12	For estimates of average (CTE) exposure, the adult exposure duration of 3 years was used based on the 50th percentile value of 9 years for time spent at a single residence, assuming 3 years as an adult and 6 years as a child.
Section 5.4, Risk Characterization Findings and Uncertainty Discussion	3rd paragraph, 2nd and 7th bullets, page 5-15	Stipulate that IRIS/RfD is based on Aroclor-1254.
Section 5.4.6, Conclusions, Uncertainties, and Recommendations/Exposure Assessment Uncertainties	last paragraph, page 5-20	The uncertainty associated with the FI term is identified. A statement has been entered that cautions the applicability of the FI term values derived for or assumed in this HHRA.
Section 5.4.6, Conclusions, Uncertainties, and Recommendations/Risk Characterization Uncertainties	2nd paragraph, page 5-22	The uncertainty associated with the risk characterization results is recognized. It states that the angler survey data (Hammond et. al. 2003) support the FI Term of 0.1 used in the draft HHRA; minor difference between the various values (i.e., those recommended by EPA) would not have any impact on the conclusions of the HHRA. That is, within the limitations and uncertainties of the FI term, the HHRA would demonstrate no unacceptable risk or hazard. Overall, the risk characterization results based on this study are likely to be more conservative.
Section 6, References		These references have been added: the draft HHRA, EPA comments on the draft HHRA, Navy responses to the EPA comments on the draft HHRA, FI derivation document, EPA comments on the FI derivation document, Navy responses to EPA comments on the FI derivation document, the revised FI derivation documents and their addendum documents, SCDNR ex-VERMILLION Reef finfish consumption survey, EPA final comments on the revised FI derivation document and the Navy responses to these comments, and EPA (1997) entitled, "*The Lognormal Distribution in Environmental Applications*".
Throughout text		Minor, non-technical, grammatical changes have been made to increase readability/correct grammatical errors.
Appendix F, Detailed Risk Assessment Worksheets		Font sizes in this appendix have been increased in order to be more legible.

Table 4-1
Documented Fish Species Found at Reference and Target Reefs

Species List for Live Bottom Area

Family	Species	
Muraenidae	spotted moray	*Gymnothorax moringa*
Gadidae	hake	*Urophycis sp.*
Holocentridae	squirrelfish	*Holocentrus adscensionis*
Serranidae	bank sea bass	*Centropristis ocyurus*
	black sea bass	*Centropristis striata*
	sand perch	*Diplectrum formosum*
	rock hind	*Epinephelus adscensionis*
	gag	*Mycteroperca microlepis*
	scamp	*Mycteroperca phenax*
	greater soapfish	*Rypticus saponaceus*
Apogonidae	cardinalfish	*Apogon sp.*
Echeneidae	remora	*Remora remora*
Carangidae	bar jack	*Caranx ruber*
	greater amberjack	*Seriola dumerili*
Coryphaenidae	dolphin	*Coryphaena hippurus*
Lutjanidae	vermilion snapper	*Rhomboplites aurorubens*
Haemulidae	tomtate	*Haemulon aurolineatum*
	white grunt	*Haemulon plumieri*
Sparidae	jolthead porgy	*Calamus bajonado*
	whitebone porgy	*Calamus leucosteus*
	knobbed porgy	*Calamus nodosus*
	spottail pinfish	*Diplodus holbrooki*
	pinfish	*Lagadon rhomboides*
	red porgy	*Pagrus pagrus*
	scup	*Stenotomus chrysops*
Sciaenidae	jackknife-fish	*Equatus lanceolatus*
Mullidae	spotted goatfish	*Pseudupeneus maculatus*
Chaetodontidae	spotfin butterflyfish	*Chaetodon ocellatus*
Pomacanthidae	blue angelfish	*Holacanthus bermudensis*
	french angelfish	*Pomacanthus paru*
Pomacentridae	cocoa damselfish	*Pomacentrus variabilis*
Sphyraenidae	great barracuda	*Sphyraena barracuda*
Labridae	Spanish hogfish	*Bodianus rufus*
	slippery dick	*Halichoeres bivittatus*
	hogfish	*Lachnolaimus maximus*
Acanthuridae	ocean surgeonfish	*Acanthurus bahianus*
Scombridae	little tunny	*Euthynnus alletteratus*
Balistidae	gray triggerfish	*Balistes capriscus*
	planehead filefish	*Monacanthus hispidus*
Tetraodontidae	bandtail puffer	*Sphoeroides spengleri*
Cheloniidae	loggerhead turtle	*Caretta caretta*

Species List for Vermilion Reef

Table 4-1
Documented Fish Species Found at Reference and Target Reefs

Family	Species	
Odontaspididae	sand tiger shark	*Odontaspis taurus*
Muraenidae	spotted moray	*Gymnothorax moringa*
Congridae	conger eel	*Conger oceanicus*
Serranidae	bank sea bass	*Centropristis ocyurus*
	black sea bass	*Centropristis striata*
	rock hind	*Epinephelus adscensionis*
	graysby	*Epinephelus cruentatus*
	gag	*Mycteroperca microlepis*
	scamp	*Mycteroperca phenax*
	greater soapfish	*Rypticus saponaceus*
Echeneidae	remora	*Remora remora*
Carangidae	crevalle jack	*Caranx hippos*
	bar jack	*Caranx ruber*
	round scad	*Decapterus punctatus*
	greater amberjack	*Seriola dumerili*
	almaco jack	*Seriola rivoliana*
	permit	*Trachinotus falcatus*
Coryphaenidae	dolphin	*Coryphaena hippurus*
Lutjanidae	gray snapper	*Lutjanus griseus*
	vermilion snapper	*Rhomboplites aurorubens*
Haemulidae	tomtate	*Haemulon aurolineatum*
	white grunt	*Haemulon plumieri*
Sparidae	sheepshead	*Archosargus probatocephalus*
	whitebone porgy	*Calamus leucosteus*
	knobbed porgy	*Calamus nodosus*
	spottail pinfish	*Diplodus holbrooki*
	red porgy	*Pagrus pagrus*
	scup	*Stenotomus chrysops*
Sciaenidae	cubbyu	*Equetus umbrosus*
Ephippidae	Atlantic spadefish	*Chaetodipterus faber*
Chaetodontidae	spotfin butterflyfish	*Chaetodon ocellatus*
Pomacanthidae	blue angelfish	*Holacanthus bermudensis*
Pomacentridae	bicolor damselfish	*Pomacentrus partitus*
	cocoa damselfish	*Pomacentrus variabilis*
Sphyraenidae	great barracuda	*Sphyraena barracuda*
Labridae	spanish hogfish	*Bodianus rufus*
	slippery dick	*Halichoeres bivittatus*
Scombridae	king mackerel	*Scomberomorus cavalla*
	Spanish mackerel	*Scomberomorus maculatus*
	yellowfin tuna	*Thunnus albacares*
Balistidae	gray triggerfish	*Balistes capriscus*
	planehead filefish	*Monacanthus hispidus*

Table 4-2
Summary of Fish Species
(Collected During Two Sampling Events)

	Location	
	Reference Reef	Target Reef
Black Sea Bass	20	11
Gag Grouper	0	0
Scamp Grouper	0	0
Vermilion Snapper	22	20
White Grunt	20	20

Table 4-3
Sample Identification Number and Date Collected

	Sample Identification Number	Date Collected	Sample Identification Number	Date Collected
Vermilion Snapper:	FS-01-VS-T	6/14/2000	FS-01-VS-R	5/3/2000
	FS-02-VS-T	6/14/2000	FS-02-VS-R	5/3/2000
	FS-03-VS-T	6/14/2000	FS-03-VS-R	5/3/2000
	FS-04-VS-T	6/14/2000	FS-04-VS-R	5/3/2000
	FS-05-VS-T	6/14/2000	FS-05-VS-R	5/3/2000
	FS-06-VS-T	6/14/2000	FS-06-VS-R	5/3/2000
	FS-07-VS-T	6/14/2000	FS-07-VS-R	5/3/2000
	FS-08-VS-T	6/14/2000	FS-08-VS-R	5/3/2000
	FS-09-VS-T	6/14/2000	FS-09-VS-R	5/3/2000
	FS-10-VS-T	6/14/2000	FS-10-VS-R	5/3/2000
	FS-11-VS-T	6/14/2000	FS-11-VS-R	5/3/2000
	FS-12-VS-T	6/14/2000	FS-12-VS-R	5/3/2000
	FS-13-VS-T	6/14/2000	FS-13-VS-R	5/3/2000
	FS-14-VS-T	6/14/2000	FS-14-VS-R	5/3/2000
	FS-15-VS-T	6/14/2000	FS-15-VS-R	5/3/2000
	FS-16-VS-T	6/14/2000	FS-16-VS-R	5/3/2000
	FS-17-VS-T	6/14/2000	FS-17-VS-R	5/3/2000
	FS-18-VS-T	6/14/2000	FS-18-VS-R	5/3/2000
	FS-19-VS-T	6/14/2000	FS-19-VS-R	5/3/2000
	FS-20-VS-T	6/14/2000	FS-20-VS-R	6/14/2000
			FS-21-VS-R	6/14/2000
			FS-22-VS-R	6/14/2000
White Grunt:	FS-01-WG-T	5/3/2000	FS-01-WG-R	5/3/2000
	FS-02-WG-T	5/3/2000	FS-02-WG-R	5/3/2000
	FS-03-WG-T	6/14/2000	FS-03-WG-R	5/3/2000
	FS-04-WG-T	6/14/2000	FS-04-WG-R	5/3/2000
	FS-05-WG-T	6/14/2000	FS-05-WG-R	5/3/2000
	FS-06-WG-T	6/14/2000	FS-06-WG-R	5/3/2000
	FS-07-WG-T	6/14/2000	FS-07-WG-R	5/3/2000
	FS-08-WG-T	6/14/2000	FS-08-WG-R	5/3/2000
	FS-09-WG-T	6/14/2000	FS-09-WG-R	5/3/2000
	FS-10-WG-T	6/14/2000	FS-10-WG-R	5/3/2000
	FS-11-WG-T	6/14/2000	FS-11-WG-R	5/3/2000
	FS-12-WG-T	6/14/2000	FS-12-WG-R	6/14/2000
	FS-13-WG-T	6/14/2000	FS-13-WG-R	6/14/2000
	FS-14-WG-T	6/14/2000	FS-14-WG-R	6/14/2000
	FS-15-WG-T	6/14/2000	FS-15-WG-R	6/14/2000
	FS-16-WG-T	6/14/2000	FS-16-WG-R	6/14/2000
	FS-17-WG-T	6/14/2000	FS-17-WG-R	6/14/2000
	FS-18-WG-T	6/14/2000	FS-18-WG-R	6/14/2000
	FS-19-WG-T	6/14/2000	FS-19-WG-R	6/14/2000
	FS-20-WG-T	6/14/2000	FS-20-WG-R	6/14/2000
Black Sea Bass:	FS-01-SB-T	5/3/2000	FS-01-SB-R	5/3/2000
	FS-02-SB-T	6/14/2000	FS-02-SB-R	5/3/2000
	FS-03-SB-T	6/14/2000	FS-03-SB-R	5/3/2000
	FS-04-SB-T	6/14/2000	FS-04-SB-R	5/3/2000
	FS-05-SB-T	6/14/2000	FS-05-SB-R	5/3/2000
	FS-06-SB-T	6/14/2000	FS-06-SB-R	5/3/2000
	FS-07-SB-T	6/14/2000	FS-07-SB-R	5/3/2000
	FS-08-SB-T	6/14/2000	FS-08-SB-R	5/3/2000
	FS-09-SB-T	6/14/2000	FS-09-SB-R	5/3/2000
	FS-10-SB-T	6/14/2000	FS-10-SB-R	5/3/2000
	FS-11-SB-T	6/14/2000	FS-11-SB-R	5/3/2000
			FS-12-SB-R	5/3/2000
			FS-13-SB-R	5/3/2000
			FS-14-SB-R	5/3/2000
			FS-15-SB-R	5/3/2000
			FS-16-SB-R	5/3/2000
			FS-17-SB-R	5/3/2000
			FS-18-SB-R	5/3/2000
			FS-19-SB-R	5/3/2000
			FS-20-SB-R	5/3/2000

Table 4-4

Length, Wieghts, Sex and Estimated Age of Fish Collected at Reference Reef

Reference Reef							
Sample Identification	**Species**	**Total Length (mm)**	**Total Weight (g)**	**Filet Weight (g)**	**Liver Weight (g)**	**Sex**	**Estimated Age**
FS-01-SB-R	Black Seabass	422	1128	194	11.82	M	9
FS-02-SB-R	Black Seabass	394	916	132	4.5	M	7
FS-03-SB-R	Black Seabass	370	699	104	3.6	M	6
FS-04-SB-R	Black Seabass	345	646	80	3.4	M	5
FS-05-SB-R	Black Seabass	322	585	148	4.2	F	4
FS-06-SB-R	Black Seabass	315	383	120	1.6	F	4
FS-07-SB-R	Black Seabass	327	504	148	2.3	F	5
FS-08-SB-R	Black Seabass	252	265	79	1.5	F	3
FS-09-SB-R	Black Seabass	278	374	100	2.6	F	4
FS-10-SB-R	Black Seabass	342	634	158	3.3	M	5
FS-11-SB-R	Black Seabass	306	421	110	3.4	M	4
FS-12-SB-R	Black Seabass	282	331	95	3	F	4
FS-13-SB-R	Black Seabass	297	373	117	2.2	F	4
FS-14-SB-R	Black Seabass	255	323	74	2.5	F	3
FS-15-SB-R	Black Seabass	266	352	87	5.5	F	3
FS-16-SB-R	Black Seabass	286	288	85	1.5	F	4
FS-17-SB-R	Black Seabass	289	330	108	3.1	F	4
FS-18-SB-R	Black Seabass	272	345	94	5	F	3
FS-19-SB-R	Black Seabass	280	265	75	1.7	F	4
FS-20-SB-R	Black Seabass	333	511	163	3.6	F	5
FS-01-VS-R	Vermilion Snapper	304	417	167	3.6	F	4
FS-02-VS-R	Vermilion Snapper	285	351	137	3.32	F	4
FS-03-VS-R	Vermilion Snapper	274	282	112	2.37	F	4
FS-04-VS-R	Vermilion Snapper	308	419	159	5.66	F	4
FS-05-VS-R	Vermilion Snapper	273	309	128	2.04	F	4
FS-06-VS-R	Vermilion Snapper	270	317	119	2.78	F	3
FS-07-VS-R	Vermilion Snapper	276	303	121	NA	M	4
FS-08-VS-R	Vermilion Snapper	270	270	110	1.7	F	3
FS-09-VS-R	Vermilion Snapper	315	463	192	5.63	F	5
FS-10-VS-R	Vermilion Snapper	295	424	147	3.75	F	5
FS-11-VS-R	Vermilion Snapper	290	324	125	1.93	M	4
FS-12-VS-R	Vermilion Snapper	299	375	158	2.63	M	4
FS-13-VS-R	Vermilion Snapper	265	321	107	2.43	F	3
FS-14-VS-R	Vermilion Snapper	274	338	138	3.91	F	4
FS-15-VS-R	Vermilion Snapper	285	348	123	2.24	M	5
FS-16-VS-R	Vermilion Snapper	295	355	139	3.35	F	5
FS-17-VS-R	Vermilion Snapper	265	284	109	3.38	F	3
FS-18-VS-R	Vermilion Snapper	278	319	124	3.29	F	4
FS-19-VS-R	Vermilion Snapper	294	405	149	3.82	F	5
FS-20-VS-R	Vermilion Snapper	283	280	102	1.49	M	4
FS-21-VS-R	Vermilion Snapper	270	306	102	2.52	F	3
FS-22-VS-R	Vermilion Snapper	284	291	114	1.25	F	4
FS-01-WG-R	White Grunt	405	1433	444	40.24	F	9
FS-02-WG-R	White Grunt	397	1062	293	5.15	F	8
FS-03-WG-R	White Grunt	370	970	268	13.3	F	7
FS-04-WG-R	White Grunt	325	572	168	4.87	F	5
FS-05-WG-R	White Grunt	307	479	148	4.49	F	5
FS-06-WG-R	White Grunt	317	526	151	4.26	M	5
FS-07-WG-R	White Grunt	350	729	234	5.85	M	7
FS-08-WG-R	White Grunt	281	381	116	2.97	M	4
FS-09-WG-R	White Grunt	297	510	147	4.48	F	5
FS-10-WG-R	White Grunt	305	501	145	3.16	M	5
FS-11-WG-R	White Grunt	290	442	127	3.68	M	4
FS-12-WG-R	White Grunt	382	861	244	5.03	M	8
FS-13-WG-R	White Grunt	401	1091	357	5.78	M	9
FS-14-WG-R	White Grunt	345	678	184	6.27	F	7
FS-15-WG-R	White Grunt	260	346	99	2.74	M	4
FS-16-WG-R	White Grunt	275	380	111	2.69	F	4
FS-17-WG-R	White Grunt	265	317	84	1.9	M	4
FS-18-WG-R	White Grunt	240	242	65	1.41	Immature	3
FS-19-WG-R	White Grunt	355	748	222	4.97	M	7
FS-20-WG-R	White Grunt	232	223	66	1.52	Immature	3
FS-01-TF-R	Toadfish	290	550		6.5	M	
FS-02-TF-R	Toadfish	299	585		7.8	F	

Table 4-5

Length, Wieghts, Sex and Estimated Age of Fish Collected at Target Reef

Target Reef							
Sample Identification	**Species**	**Total Length (mm)**	**Total Weight (g)**	**Filet Weight (g)**	**Liver Weight (g)**	**Sex**	**Estimated Age**
FS-01-SB-T	Black Seabass	315	546	72	5.5	F	4
FS-02-SB-T	Black Seabass	292	520	198	11.44	F	4
FS-03-SB-T	Black Seabass	321	639	232	16.47	F	5
FS-04-SB-T	Black Seabass	315	663	259	19.49	M	4
FS-05-SB-T	Black Seabass	300	530	174	14.75	F	4
FS-06-SB-T	Black Seabass	355	917	342	26.84	F	5
FS-07-SB-T	Black Seabass	425	1231	431	20.76	M	9
FS-08-SB-T	Black Seabass	310	513	150	17.47	Immature	4
FS-09-SB-T	Black Seabass	336	713	248	19.82	F	5
FS-10-SB-T	Black Seabass	296	515	162	16.08	F	4
FS-11-SB-T	Black Seabass	267	391	144	10.83	M	3
FS-01-VS-T	Vermilion Snapper	314	444	161	7.37	F	4
FS-02-VS-T	Vermilion Snapper	314	449	193	5.32	M	4
FS-03-VS-T	Vermilion Snapper	305	425	169	5.42	F	4
FS-04-VS-T	Vermilion Snapper	335	615	231	11.82	F	5
FS-05-VS-T	Vermilion Snapper	355	777	326	5.62	M	6
FS-06-VS-T	Vermilion Snapper	346	620	270	6.54	M	5
FS-07-VS-T	Vermilion Snapper	305	441	190	4.31	M	4
FS-08-VS-T	Vermilion Snapper	320	496	206	8.65	F	5
FS-09-VS-T	Vermilion Snapper	348	612	260	6.85	M	5
FS-10-VS-T	Vermilion Snapper	305	440	183	6.25	F	4
FS-11-VS-T	Vermilion Snapper	310	457	191	7.11	M	4
FS-12-VS-T	Vermilion Snapper	334	513	194	11.77	F	5
FS-13-VS-T	Vermilion Snapper	320	525	219	12.22	F	5
FS-14-VS-T	Vermilion Snapper	295	381	157	3.81	M	4
FS-15-VS-T	Vermilion Snapper	358	720	304	11.26	F	6
FS-16-VS-T	Vermilion Snapper	305	436	194	7.82	F	4
FS-17-VS-T	Vermilion Snapper	295	400	159	8.13	F	4
FS-18-VS-T	Vermilion Snapper	302	392	170	3.6	F	4
FS-19-VS-T	Vermilion Snapper	314	471	196	6.99	F	4
FS-20-VS-T	Vermilion Snapper	360	697	290	9.28	F	6
FS-01-WG-T	White Grunt	374	1012	347	18.5	F	7
FS-02-WG-T	White Grunt	422	1329	470	32.01	M	10
FS-03-WG-T	White Grunt	293	489	163	12.93	F	5
FS-04-WG-T	White Grunt	274	424	128	13.13	F	4
FS-05-WG-T	White Grunt	250	304	104	6.55	F	3
FS-06-WG-T	White Grunt	233	227	71	3.1	F	3
FS-07-WG-T	White Grunt	321	676	237	13.1	F	5
FS-08-WG-T	White Grunt	258	276	96	3.01	F	4
FS-09-WG-T	White Grunt	243	241	84	1.66	Immature	3
FS-10-WG-T	White Grunt	378	999	317	28.78	M	7
FS-11-WG-T	White Grunt	315	568	198	11.61	M	5
FS-12-WG-T	White Grunt	365	928	302	20.2	F	7
FS-13-WG-T	White Grunt	274	344	113	6.56	M	4
FS-14-WG-T	White Grunt	235	227	72	2.39	Immature	3
FS-15-WG-T	White Grunt	422	1464	515	29.46	M	10
FS-16-WG-T	White Grunt	247	279	87	4	F	3
FS-17-WG-T	White Grunt	440	1709	537	39.03	F	11
FS-18-WG-T	White Grunt	432	1592	492	34.87	F	10
FS-19-WG-T	White Grunt	255	311	99	4.7	Immature	4
FS-20-WG-T	White Grunt	374	962	294	7.93		7
FS-21-WG-T	White Grunt	255	310	Not Processed			4
FS-22-WG-T	White Grunt	232	240	Not Processed			3
FS-23-WG-T	White Grunt	290	478	Not Processed			5
FS-24-WG-T	White Grunt	215	171	Not Processed			3

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager: URS:** Peter Tong **NEHC:** Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 **Fax:** (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
5/3/00	1025	NEHC-0001	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1020	NEHC-0002	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1022	NEHC-0003	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1024	NEHC-0004	**FI**	**1**	**X**	**X**	**X**					**1**
5/2/00	1025	NEHC-0005	**FI**	**1**	**X**	**X**	**X**					**1**
5/2/00	0930	NEHC-0006	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1026	NEHC-0007	**FI**	**1**	**X**	**X**	**X**					**1**
6/14/00	1530	NEHC-0008	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1017	NEHC-0009	**FI**	**1**	**X**	**X**	**X**					**1**
5/2/00	0935	NEHC-0010	**FI**	**1**	**X**	**X**	**X**					**1**
Preservatives used: Wet Ice		**(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue**										

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6075

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

URS
263 Seaboard Lane, Suite 200
Franklin, TN 37067
615-771-2480

Remarks (Write out QC Sample Types)

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager: URS:** Peter Tong **NEHC:** Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 **Fax:** (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
5/2/00	1025	NEHC-0011	**FI**	**1**	**X**	**X**	**X**					**1**
6/14/00	1431	NEHC-0012	**FI**	**1**	**X**	**X**	**X**					**1**
6/14/00	1552	NEHC-0013	**FI**	**1**	**X**	**X**	**X**					**1**
6/14/00	1504	NEHC-0014	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1004	NEHC-0015	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1008	NEHC-0016	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1002	NEHC-0017	**FI**	**1**	**X**	**X**	**X**					**1**
5/3/00	1124	NEHC-0018	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	0951	NEHC-0019	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1426	NEHC-0020	**FI**	**1**	**X**	**X**	**X**					**2**

Preservatives used: Wet Ice

(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6123

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

URS
263 Seaboard Lane, Suite 200
Franklin, TN 37067
615-771-2480

Remarks (Write out QC Sample Types)

MS/DUP

MS/DUP

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name: Navy Reefex / Vermillion Reef, Charleston, SC**											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager: URS: Peter Tong NEHC: Andrea Lunsford**											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 Fax: (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
6/14/00	1608	NEHC-0021	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1604	NEHC-0022	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1552	NEHC-0023	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1052	NEHC-0024	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1005	NEHC-0025	**FI**	**1**	**X**	**X**	**X**					**2**
5/2/00	1008	NEHC-0026	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1533	NEHC-0027	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1102	NEHC-0028	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1522	NEHC-0029	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1040	NEHC-0030	**FI**	**1**	**X**	**X**	**X**					**2**
Preservatives used: Wet Ice			**(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue**									

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6086

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

263 Seaboard Lane, Suite 200
Franklin, TN 37067
615-771-2480

Remarks (Write out QC Sample Types)

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 **Fax:** (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
6/14/00	1612	NEHC-0031	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1509	NEHC-0032	**FI**	**1**	**X**	**X**	**X**					**2**
5/2/00	1020	NEHC-0033	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1020	NEHC-0034	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	0945	NEHC-0035	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1617	NEHC-0036	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1608	NEHC-0037	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1357	NEHC-0038	**FI**	**1**	**X**	**X**	**X**					**3**
5/3/00	1010	NEHC-0039	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1128	NEHC-0040	**FI**	**1**	**X**	**X**	**X**					**3**

Preservatives used: Wet Ice

(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue

Remarks (Write out QC Sample Types)

MS/DUP

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6097

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

URS
263 Seaboard Lane, Suite 200
Franklin, TN 37067
615-771-2480

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 **Fax:** (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
5/2/00	1020	NEHC-0041	**FI**	**1**	**X**	**X**	**X**					**3**
5/3/00	1020	NEHC-0042	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1622	NEHC-0043	**FI**	**1**	**X**	**X**	**X**					**3**
5/2/00	1020	NEHC-0044	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1400	NEHC-0045	**FI**	**1**	**X**	**X**	**X**					**3**
5/3/00	1020	NEHC-0046	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1542	NEHC-0047	**FI**	**1**	**X**	**X**	**X**					**3**
5/3/00	1020	NEHC-0048	**FI**	**1**	**X**	**X**	**X**					**3**
5/2/00	0951	NEHC-0049	**FI**	**1**	**X**	**X**	**X**					**3**
6/14/00	1537	NEHC-0050	**FI**	**1**	**X**	**X**	**X**					**3**
Preservatives used: Wet Ice			**(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue**									

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
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Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6101

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

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Franklin, TN 37067

615-771-2480

Remarks (Write out QC Sample Types)

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Coreen Hamilton, Axys Analytical Services, Ltd.												
Address: 2045 Mills Road West, Sidney, BC, Canada V8L 3S8												
Phone: (250) 655-5800 **Fax:** (250) 655-5811												
Company Name: URS Corporation												
Sample Date/Time	**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**Method 1668**	**Lipid Analysis**	**Moisture**					**Assigned Batch**	**Remarks (Write out QC Sample Types)**
6/14/00 1127	NEHC-0051	**FI**	**1**	**X**	**X**	**X**					**3**	
6/14/00 1548	NEHC-0052	**FI**	**1**	**X**	**X**	**X**					**3**	
6/14/00 1548	NEHC-0053	**FI**	**1**	**X**	**X**	**X**					**3**	
Preservatives used: Wet Ice	(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue											TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: Master 8167 2625 6112

Laboratory Name and Phone Number: Axys Laboratory (250) 655-5800

Laboratory Address: 2045 Mills Rd. West, Sidney, BC, Canada V8L 3S8

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

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615-771-2480

Table 4-6
Sample ID, Types, and Analyses Performed

URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC
Project Location: Charleston, South Carolina	
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford
Send Report To: Persons identified by conference call	
Billing Contact: Stephanie Roy, Arthur D. Little Inc. **Address:** Acorn Park **City:** Cambridge **State/Zip:** MA 02140 **Phone:** (617) 498-5340 **Fax:** (617) 498-7296	
Company Name: URS Corporation	

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Sample Date/Time	Field Identification: Sample Number	Matrix *	Number of Containers	Methods and/or Analytes: PCBs by ADL Analytical SOP	Lipid Analysis	Moisture					Assigned Batch	Remarks (Write out QC Sample Types)
5/3/00 1025	NEHC-0001	FI	1	X	X	X					1	
5/3/00 1020	NEHC-0002	FI	1	X	X	X					1	
5/3/00 1022	NEHC-0003	FI	1	X	X	X					1	
5/3/00 1024	NEHC-0004	FI	1	X	X	X					1	
5/2/00 1025	NEHC-0005	FI	1	X	X	X					1	
5/2/00 0930	NEHC-0006	FI	1	X	X	X					1	
5/3/00 1026	NEHC-0007	FI	1	X	X	X					1	
6/14/00 1530	NEHC-0008	FI	1	X	X	X					1	
5/3/00 1017	NEHC-0009	FI	1	X	X	X					1	
5/2/00 0935	NEHC-0010	FI	1	X	X	X					1	
Preservatives used: Wet Ice	(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue											TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	Date/Time
Relinquished By:	7/9/2001 16:00
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX
Airbill No.: 790942788760
Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340
Laboratory Address: Acorn Park, Cambridge, MA 02140

Custody Seals Present? Yes No
Custody Seals Intact? Yes No

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Stephanie Roy, Arthur D. Little Inc.												
Address: Acorn Park												
City: Cambridge **State/Zip:** MA 02140 **Phone:** (617) 498-5340 **Fax:** (617) 498-7296												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**PCBs by ADL Analytical SOP**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
5/2/00	1025	NEHC-0011	FI	1	X	X	X					1
6/14/00	1431	NEHC-0012	FI	1	X	X	X					1
6/14/00	1552	NEHC-0013	FI	1	X	X	X					1
6/14/00	1504	NEHC-0014	FI	1	X	X	X					1
5/3/00	1004	NEHC-0015	FI	1	X	X	X					1
5/3/00	1008	NEHC-0016	FI	1	X	X	X					1
5/3/00	1002	NEHC-0017	FI	1	X	X	X					1
5/3/00	1124	NEHC-0018	FI	1	X	X	X					2
5/3/00	0951	NEHC-0019	FI	1	X	X	X					2
6/14/00	1426	NEHC-0020	FI	1	X	X	X					2

Preservatives used: Wet Ice

(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	Date/Time
Relinquished By:	7/9/2001 16:00
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Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX

Airbill No.: 790942788760

Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340

Laboratory Address: Acorn Park, Cambridge, MA 02140

Custody Seals Present? Yes No

Custody Seals Intact? Yes No

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615-771-2480

Remarks (Write out QC Sample Types)

MS/DUP

MS/DUP

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Stephanie Roy, Arthur D. Little Inc.												
Address: Acorn Park												
City: Cambridge **State/Zip:** MA 02140 **Phone:** (617) 498-5340 **Fax:** (617) 498-7296												
Company Name: URS Corporation												
Sample Date/Time		**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**PCBs by ADL Analytical SOP**	**Lipid Analysis**	**Moisture**					**Assigned Batch**
6/14/00	1608	NEHC-0021	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1604	NEHC-0022	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1552	NEHC-0023	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1052	NEHC-0024	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1005	NEHC-0025	**FI**	**1**	**X**	**X**	**X**					**2**
5/2/00	1008	NEHC-0026	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1533	NEHC-0027	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1102	NEHC-0028	**FI**	**1**	**X**	**X**	**X**					**2**
6/14/00	1522	NEHC-0029	**FI**	**1**	**X**	**X**	**X**					**2**
5/3/00	1040	NEHC-0030	**FI**	**1**	**X**	**X**	**X**					**2**
Preservatives used: Wet Ice			**(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue**									

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX
Airbill No.: 790098344699
Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340
Laboratory Address: Acorn Park, Cambridge, MA 02140
Custody Seals Present? Yes No
Custody Seals Intact? Yes No

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Franklin, TN 37067
615-771-2480

Remarks (Write out QC Sample Types)

Table 4-6
Sample ID, Types, and Analyses Performed

URS Project No.: 53F00E9612.02/00002 | Project Name: Navy Reefex / Vermillion Reef, Charleston, SC

Project Location: **Charleston, South Carolina**

Sampling Team Leader: Todd D. Hunt | Project Manager: URS: Peter Tong NEHC: Andrea Lunsford

Send Report To: **Persons identified by conference call**

Billing Contact: **Stephanie Roy, Arthur D. Little Inc.**
Address: **Acorn Park**
City: **Cambridge** State/Zip: **MA 02140** Phone: **(617) 498-5340** Fax: **(617) 498-7296**
Company Name: URS Corporation

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Sample Date/Time	Field Identification: Sample Number	Matrix *	Number of Containers	Methods and/or Analytes: PCBs by ADL Analytical SOP	Lipid Analysis	Moisture					Assigned Batch	Remarks (Write out QC Sample Types)
6/14/00 1612	NEHC-0031	FI	1	X	X	X					2	
6/14/00 1509	NEHC-0032	FI	1	X	X	X					2	
5/2/00 1020	NEHC-0033	FI	1	X	X	X					2	
5/3/00 1020	NEHC-0034	FI	1	X	X	X					2	
5/3/00 0945	NEHC-0035	FI	1	X	X	X					2	
6/14/00 1617	NEHC-0036	FI	1	X	X	X					3	
6/14/00 1608	NEHC-0037	FI	1	X	X	X					3	
6/14/00 1357	NEHC-0038	FI	1	X	X	X					3	MS/DUP
5/3/00 1010	NEHC-0039	FI	1	X	X	X					3	
6/14/00 1128	NEHC-0040	FI	1	X	X	X					3	

Preservatives used: Wet Ice

(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue

TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	Date/Time
Relinquished By:	7/9/2001 16:00
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX
Airbill No.: 790098344699
Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340
Laboratory Address: Acorn Park, Cambridge, MA 02140

Custody Seals Present? Yes No
Custody Seals Intact? Yes No

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	Project Name: Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	Project Manager: URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Stephanie Roy, Arthur D. Little Inc.												
Address: Acorn Park												
City: Cambridge	State/Zip: MA 02140	Phone: (617) 498-5340	Fax: (617) 498-7296									
Company Name: URS Corporation												
Sample Date/Time	**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**PCBs by ADL Analytical SOP**	**Lipid Analysis**	**Moisture**					**Assigned Batch**	**Remarks (Write out QC Sample Types)**
5/2/00 1020	NEHC-0041	FI	1	X	X	X					3	
5/3/00 1020	NEHC-0042	FI	1	X	X	X					3	
6/14/00 1622	NEHC-0043	FI	1	X	X	X					3	
5/2/00 1020	NEHC-0044	FI	1	X	X	X					3	
6/14/00 1400	NEHC-0045	FI	1	X	X	X					3	
5/3/00 1020	NEHC-0046	FI	1	X	X	X					3	
6/14/00 1542	NEHC-0047	FI	1	X	X	X					3	
5/3/00 1020	NEHC-0048	FI	1	X	X	X					3	
5/2/00 0951	NEHC-0049	FI	1	X	X	X					3	
6/14/00 1537	NEHC-0050	FI	1	X	X	X					3	
Preservatives used: Wet Ice	(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue											TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	Date/Time
Relinquished By:	7/9/2001 16:00
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX
Airbill No.: 790098344840
Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340
Laboratory Address: Acorn Park, Cambridge, MA 02140

Custody Seals Present? Yes No
Custody Seals Intact? Yes No

URS
263 Seaboard Lane, Suite 200
Franklin, TN 37067
615-771-2480

Table 4-6
Sample ID, Types, and Analyses Performed

				Methods and/or Analytes								
URS Project No.: 53F00E9612.02/00002	**Project Name:** Navy Reefex / Vermillion Reef, Charleston, SC											
Project Location: Charleston, South Carolina												
Sampling Team Leader: Todd D. Hunt	**Project Manager:** URS: Peter Tong NEHC: Andrea Lunsford											
Send Report To: Persons identified by conference call												
Billing Contact: Stephanie Roy, Arthur D. Little Inc.												
Address: Acorn Park												
City: Cambridge **State/Zip:** MA 02140 **Phone:** (617) 498-5340 **Fax:** (617) 498-7296												
Company Name: URS Corporation												
Sample Date/Time	**Field Identification: Sample Number**	**Matrix ***	**Number of Containers**	**PCBs by ADL Analytical SOP**	**Lipid Analysis**	**Moisture**					**Assigned Batch**	**Remarks (Write out QC Sample Types)**
6/14/00 1127	NEHC-0051	FI	1	X	X	X					3	
6/14/00 1548	NEHC-0052	FI	1	X	X	X					3	
6/14/00 1548	NEHC-0053	FI	1	X	X	X					3	
Preservatives used: Wet Ice	(SW)=Surface Water, (GW)=Groundwater, (SO)=Soil, (SD) = Sediment, (FI)=Fish Tissue											TB=Trip Blank, RS=Rinsate, MS=Matrix Spike, DUP=Matrix Duplicate

Signature	**Date/Time**
Relinquished By:	**7/9/2001 16:00**
Received By:	
Relinquished By:	
Received By:	
Relinquished By:	
Received By Laboratory:	

Method of Shipment: FEDEX
Airbill No.: 790098344840
Laboratory Name and Phone Number: ADL Laboratory (617) 498-5340
Laboratory Address: Acorn Park, Cambridge, MA 02140
Custody Seals Present? Yes No
Custody Seals Intact? Yes No

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615-771-2480

Table 5-1
Target Vs. Reference Concentrations
PCBs in Fish

Fish Species	Parameter	Reference Reef Lognormal 95% UTL (pg/g)	Target Reef Average Concentration (pg/g)	Target Reef Maximum Detected Concentration (pg/g)
White Grunt	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1,268	10,377	50,200
White Grunt	114 - 2,3,4,4',5-Pentachlorobiphenyl	82	673	3,880
White Grunt	118 - 2,3',4,4',5-Pentachlorobiphenyl	3,870	30,308	51,900
White Grunt	123 - 2',3,4,4',5-Pentachlorobiphenyl	45	335	335
White Grunt	126 - 3,3',4,4',5-Pentachlorobiphenyl	12	11	65
White Grunt	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	537	4,463	22,800
White Grunt	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	154	879	4,390
White Grunt	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	205	1,603	7,970
White Grunt	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	1.8	6.4	6.4
White Grunt	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	515	3,414	15,000
White Grunt	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1,181	10,958	55,800
White Grunt	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	29	174	826
White Grunt	77 - 3,3',4,4'-Tetrachlorobiphenyl	12	60	389
White Grunt	Total Monochlorobiphenyl	2.6	2.4	18
White Grunt	Total Dichlorobiphenyls	38	121	1,050
White Grunt	Total Trichlorobiphenyls	123	2,324	14,900
White Grunt	Total Tetrachlorobiphenyls	1,244	28,797	66,500
White Grunt	Total Pentachlorobiphenyls	10,206	107,931	95,300
White Grunt	Total Hexachlorobiphenyls	13,464	119,041	70,100
White Grunt	Total Heptachlorobiphenyls	3,268	30,715	82,600
White Grunt	Total Octachlorobiphenyls	1,043	12,136	62,200
White Grunt	Total Nonachlorobiphenyls	413	2,042	12,600
White Grunt	209 - Decachlorobiphenyl	64	80	424
White Grunt	Total Polychlorinated Biphenyls	30,397	303,270	96,900
Vermilion Snapper	105 - 2,3,3',4,4'-Pentachlorobiphenyl	369	464	1,980
Vermilion Snapper	114 - 2,3,4,4',5-Pentachlorobiphenyl	22	26	110
Vermilion Snapper	118 - 2,3',4,4',5-Pentachlorobiphenyl	1,215	1,282	5,060
Vermilion Snapper	123 - 2',3,4,4',5-Pentachlorobiphenyl	18	18	82
Vermilion Snapper	126 - 3,3',4,4',5-Pentachlorobiphenyl	8.6	2.8	11
Vermilion Snapper	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	204	151	618
Vermilion Snapper	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	51	35	129
Vermilion Snapper	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	100	60	229
Vermilion Snapper	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	2.6	0.7	4.3
Vermilion Snapper	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	351	137	751
Vermilion Snapper	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	992	382	2,460
Vermilion Snapper	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	15	6.1	26
Vermilion Snapper	77 - 3,3',4,4'-Tetrachlorobiphenyl	15	6.7	15
Vermilion Snapper	Total Monochlorobiphenyl	6.8	1.4	2.7
Vermilion Snapper	Total Dichlorobiphenyls	34	18	25
Vermilion Snapper	Total Trichlorobiphenyls	196	149	218
Vermilion Snapper	Total Tetrachlorobiphenyls	923	1,415	3,600
Vermilion Snapper	Total Pentachlorobiphenyls	4,662	6,165	21,700
Vermilion Snapper	Total Hexachlorobiphenyls	8,133	5,290	20,000
Vermilion Snapper	Total Heptachlorobiphenyls	2,832	1,304	7,370
Vermilion Snapper	Total Octachlorobiphenyls	833	390	2,170
Vermilion Snapper	Total Nonachlorobiphenyls	323	93	419
Vermilion Snapper	209 - Decachlorobiphenyl	53	8.1	34
Vermilion Snapper	Total Polychlorinated Biphenyls	17,163	14,834	49,700
Black Sea Bass	105 - 2,3,3',4,4'-Pentachlorobiphenyl	338	1,214	2,060
Black Sea Bass	114 - 2,3,4,4',5-Pentachlorobiphenyl	20	76	188
Black Sea Bass	118 - 2,3',4,4',5-Pentachlorobiphenyl	1,072	3,946	9,390
Black Sea Bass	123 - 2',3,4,4',5-Pentachlorobiphenyl	19	46	99
Black Sea Bass	126 - 3,3',4,4',5-Pentachlorobiphenyl	9.2	7.3	18
Black Sea Bass	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	226	472	1,050
Black Sea Bass	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	61	118	253
Black Sea Bass	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	96	196	446
Black Sea Bass	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	2.9	3.2	11
Black Sea Bass	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	601	477	763
Black Sea Bass	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1,842	1,157	2,160
Black Sea Bass	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	24	19	35
Black Sea Bass	77 - 3,3',4,4'-Tetrachlorobiphenyl	8.4	9.4	22
Black Sea Bass	Total Monochlorobiphenyl	6.0	1.9	3.5
Black Sea Bass	Total Dichlorobiphenyls	7.6	23	52
Black Sea Bass	Total Trichlorobiphenyls	78	235	511

Table 5-1
Target Vs. Reference Concentrations
PCBs in Fish

Fish Species	Parameter	Reference Reef Lognormal 95% UTL (pg/g)	Target Reef Average Concentration (pg/g)	Target Reef Maximum Detected Concentration (pg/g)
Black Sea Bass	Total Tetrachlorobiphenyls	830	3,287	8,400
Black Sea Bass	Total Pentachlorobiphenyls	3,163	14,940	36,000
Black Sea Bass	Total Hexachlorobiphenyls	9,070	15,407	32,600
Black Sea Bass	Total Heptachlorobiphenyls	5,913	4,173	7,850
Black Sea Bass	Total Octachlorobiphenyls	2,337	1,311	3,240
Black Sea Bass	Total Nonachlorobiphenyls	912	379	1,110
Black Sea Bass	209 - Decachlorobiphenyl	167	60	148
Black Sea Bass	Total Polychlorinated Biphenyls	21,365	39,809	88,600

Table 5-2
Results of Wilcoxon Rank Test for Comparison of Means
Target vs Reference Reef PCB Fish Concentrations

Fish Species	Parameter	Probability (Prob>|Z|)	Target Fish PCB Concentrations Statistically Differ from Reference Fish PCB Concentrations (95% Confidence Level)
White Grunt	105 - 2,3,3',4,4'-Pentachlorobiphenyl	<.0001	YES
White Grunt	114 - 2,3,4,4',5-Pentachlorobiphenyl	<.0001	YES
White Grunt	118 - 2,3',4,4',5-Pentachlorobiphenyl	<.0001	YES
White Grunt	123 - 2',3,4,4',5-Pentachlorobiphenyl	<.0001	YES
White Grunt	126 - 3,3',4,4',5-Pentachlorobiphenyl	<.0001	YES
White Grunt	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	<.0001	YES
White Grunt	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	<.0001	YES
White Grunt	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	<.0001	YES
White Grunt	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	<.0001	YES
White Grunt	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	<.0001	YES
White Grunt	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	<.0001	YES
White Grunt	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	<.0001	YES
White Grunt	77 - 3,3',4,4'-Tetrachlorobiphenyl	<.0001	YES
White Grunt	Total Monochlorobiphenyl	<.0001	YES
White Grunt	Total Dichlorobiphenyls	<.0001	YES
White Grunt	Total Trichlorobiphenyls	<.0001	YES
White Grunt	Total Tetrachlorobiphenyls	<.0001	YES
White Grunt	Total Pentachlorobiphenyls	<.0001	YES
White Grunt	Total Hexachlorobiphenyls	<.0001	YES
White Grunt	Total Heptachlorobiphenyls	<.0001	YES
White Grunt	Total Octachlorobiphenyls	<.0001	YES
White Grunt	Total Nonachlorobiphenyls	<.0001	YES
White Grunt	209 - Decachlorobiphenyl	0.0001	YES
White Grunt	Total Polychlorinated Biphenyls	<.0001	YES
Black Sea Bass	105 - 2,3,3',4,4'-Pentachlorobiphenyl	<.0001	YES
Black Sea Bass	114 - 2,3,4,4',5-Pentachlorobiphenyl	<.0001	YES
Black Sea Bass	118 - 2,3',4,4',5-Pentachlorobiphenyl	<.0001	YES
Black Sea Bass	123 - 2',3,4,4',5-Pentachlorobiphenyl	<.0001	YES
Black Sea Bass	126 - 3,3',4,4',5-Pentachlorobiphenyl	0.0004	YES
Black Sea Bass	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	<.0001	YES
Black Sea Bass	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	<.0001	YES
Black Sea Bass	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	<.0001	YES
Black Sea Bass	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	0.0004	YES
Black Sea Bass	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0001	YES
Black Sea Bass	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0001	YES
Black Sea Bass	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.0001	YES
Black Sea Bass	77 - 3,3',4,4'-Tetrachlorobiphenyl	<.0001	YES
Black Sea Bass	Total Monochlorobiphenyl	0.0004	YES
Black Sea Bass	Total Dichlorobiphenyls	<.0001	YES
Black Sea Bass	Total Trichlorobiphenyls	<.0001	YES
Black Sea Bass	Total Tetrachlorobiphenyls	<.0001	YES
Black Sea Bass	Total Pentachlorobiphenyls	<.0001	YES
Black Sea Bass	Total Hexachlorobiphenyls	<.0001	YES
Black Sea Bass	Total Heptachlorobiphenyls	0.0002	YES
Black Sea Bass	Total Octachlorobiphenyls	0.0060	YES
Black Sea Bass	Total Nonachlorobiphenyls	0.1543	NO
Black Sea Bass	209 - Decachlorobiphenyl	0.4956	NO
Black Sea Bass	Total Polychlorinated Biphenyls	<.0001	YES

Table 5-2
Results of Wilcoxon Rank Test for Comparison of Means
Target vs Reference Reef PCB Fish Concentrations

Fish Species	Parameter	Probability (Prob>|Z|)	Target Fish PCB Concentrations Statistically Differ from Reference Fish PCB Concentrations (95% Confidence Level)
Vermilion Snapper	105 - 2,3,3',4,4'-Pentachlorobiphenyl	<.0001	YES
Vermilion Snapper	114 - 2,3,4,4',5-Pentachlorobiphenyl	<.0001	YES
Vermilion Snapper	118 - 2,3',4,4',5-Pentachlorobiphenyl	<.0001	YES
Vermilion Snapper	123 - 2',3,4,4',5-Pentachlorobiphenyl	0.0003	YES
Vermilion Snapper	126 - 3,3',4,4',5-Pentachlorobiphenyl	0.0275	YES
Vermilion Snapper	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	0.0234	YES
Vermilion Snapper	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	0.1244	NO
Vermilion Snapper	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	0.0572	NO
Vermilion Snapper	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	0.4349	NO
Vermilion Snapper	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.5882	NO
Vermilion Snapper	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.9799	NO
Vermilion Snapper	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.3077	NO
Vermilion Snapper	77 - 3,3',4,4'-Tetrachlorobiphenyl	0.5045	NO
Vermilion Snapper	Total Monochlorobiphenyl	0.0010	YES
Vermilion Snapper	Total Dichlorobiphenyls	0.0048	YES
Vermilion Snapper	Total Trichlorobiphenyls	<.0001	YES
Vermilion Snapper	Total Tetrachlorobiphenyls	<.0001	YES
Vermilion Snapper	Total Pentachlorobiphenyls	<.0001	YES
Vermilion Snapper	Total Hexachlorobiphenyls	0.0073	YES
Vermilion Snapper	Total Heptachlorobiphenyls	0.8305	NO
Vermilion Snapper	Total Octachlorobiphenyls	0.1819	NO
Vermilion Snapper	Total Nonachlorobiphenyls	0.0019	YES
Vermilion Snapper	209 - Decachlorobiphenyl	0.0004	YES
Vermilion Snapper	Total Polychlorinated Biphenyls	0.0001	YES

Table 5-3
Exposure Point Concentrations
PCBs in Fish

Fish Group	Parameter	Average Concentration (mg/kg)	Calculated 95% UCL (mg/kg)	Statistical Method for 95% UCL Calculation
Sea Bass-Reference Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1.02E-04	1.30E-04	Standard Bootstrap
Sea Bass-Reference Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	5.64E-06	7.21E-06	Standard Bootstrap
Sea Bass-Reference Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	3.17E-04	4.17E-04	Standard Bootstrap
Sea Bass-Reference Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	2.97E-06	5.26E-06	H-Statistic
Sea Bass-Reference Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	2.23E-06	2.94E-06	H-Statistic
Sea Bass-Reference Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6.35E-05	8.99E-05	Standard Bootstrap
Sea Bass-Reference Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1.76E-05	2.41E-05	Standard Bootstrap
Sea Bass-Reference Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	2.56E-05	3.51E-05	Standard Bootstrap
Sea Bass-Reference Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	9.48E-07	1.11E-06	t-Statistic
Sea Bass-Reference Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1.49E-04	2.36E-04	Jackknife
Sea Bass-Reference Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	4.42E-04	7.32E-04	Jackknife
Sea Bass-Reference Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.36E-06	9.66E-06	Jackknife
Sea Bass-Reference Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	1.18E-06	2.25E-06	H-Statistic
Sea Bass-Reference Reef	Total Monochlorobiphenyl	7.36E-07	9.31E-07	t-Statistic
Sea Bass-Reference Reef	Total Dichlorobiphenyls	2.50E-06	3.03E-06	H-Statistic
Sea Bass-Reference Reef	Total Trichlorobiphenyls	9.78E-06	1.44E-05	Jackknife
Sea Bass-Reference Reef	Total Tetrachlorobiphenyls	1.12E-04	2.35E-04	H-Statistic
Sea Bass-Reference Reef	Total Pentachlorobiphenyls	8.43E-04	1.10E-03	Standard Bootstrap
Sea Bass-Reference Reef	Total Hexachlorobiphenyls	2.43E-03	3.41E-03	Standard Bootstrap
Sea Bass-Reference Reef	Total Heptachlorobiphenyls	1.50E-03	2.32E-03	Jackknife
Sea Bass-Reference Reef	Total Octachlorobiphenyls	6.23E-04	8.38E-04	Standard Bootstrap
Sea Bass-Reference Reef	Total Nonachlorobiphenyls	2.55E-04	3.27E-04	Standard Bootstrap
Sea Bass-Reference Reef	209 - Decachlorobiphenyl	4.70E-05	5.89E-05	H-Statistic
Sea Bass-Reference Reef	Total Polychlorinated Biphenyls	5.83E-03	8.12E-03	Standard Bootstrap
Sea Bass-Target Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1.21E-03	1.54E-03	t-Statistic
Sea Bass-Target Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	7.55E-05	1.02E-04	t-Statistic
Sea Bass-Target Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	3.95E-03	5.27E-03	t-Statistic
Sea Bass-Target Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	4.60E-05	6.06E-05	t-Statistic
Sea Bass-Target Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	7.33E-06	1.26E-05	H-Statistic
Sea Bass-Target Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	4.72E-04	6.35E-04	t-Statistic
Sea Bass-Target Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1.18E-04	1.55E-04	t-Statistic
Sea Bass-Target Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	1.96E-04	2.60E-04	t-Statistic
Sea Bass-Target Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	3.18E-06	5.64E-06	H-Statistic
Sea Bass-Target Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	4.77E-04	6.08E-04	t-Statistic
Sea Bass-Target Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.16E-03	1.50E-03	t-Statistic
Sea Bass-Target Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.92E-05	2.48E-05	t-Statistic
Sea Bass-Target Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	9.36E-06	1.29E-05	t-Statistic
Sea Bass-Target Reef	Total Monochlorobiphenyl	1.94E-06	2.38E-06	t-Statistic
Sea Bass-Target Reef	Total Dichlorobiphenyls	2.25E-05	2.96E-05	t-Statistic
Sea Bass-Target Reef	Total Trichlorobiphenyls	2.35E-04	3.11E-04	t-Statistic
Sea Bass-Target Reef	Total Tetrachlorobiphenyls	3.29E-03	4.44E-03	t-Statistic
Sea Bass-Target Reef	Total Pentachlorobiphenyls	1.49E-02	2.00E-02	t-Statistic
Sea Bass-Target Reef	Total Hexachlorobiphenyls	1.54E-02	2.01E-02	t-Statistic
Sea Bass-Target Reef	Total Heptachlorobiphenyls	4.17E-03	5.48E-03	t-Statistic
Sea Bass-Target Reef	Total Octachlorobiphenyls	1.31E-03	2.32E-03	H-Statistic
Sea Bass-Target Reef	Total Nonachlorobiphenyls	3.79E-04	6.50E-04	H-Statistic
Sea Bass-Target Reef	209 - Decachlorobiphenyl	6.00E-05	8.20E-05	t-Statistic
Sea Bass-Target Reef	Total Polychlorinated Biphenyls	3.98E-02	5.22E-02	t-Statistic
White Grunt-Reference Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1.64E-04	3.11E-04	Standard Bootstrap
White Grunt-Reference Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	9.98E-06	1.88E-05	Standard Bootstrap
White Grunt-Reference Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	4.79E-04	8.80E-04	Standard Bootstrap
White Grunt-Reference Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	4.75E-06	5.84E-06	Jackknife
White Grunt-Reference Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	9.91E-07	1.61E-06	Jackknife

Table 5-3
Exposure Point Concentrations
PCBs in Fish

Fish Group	Parameter	Average Concentration (mg/kg)	Calculated 95% UCL (mg/kg)	Statistical Method for 95% UCL Calculation
White Grunt-Reference Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6.41E-05	1.18E-04	Standard Bootstrap
White Grunt-Reference Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1.69E-05	2.24E-05	Jackknife
White Grunt-Reference Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	2.57E-05	4.40E-05	Standard Bootstrap
White Grunt-Reference Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	1.75E-07	2.32E-07	Standard Bootstrap
White Grunt-Reference Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	6.45E-05	8.55E-05	Jackknife
White Grunt-Reference Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.53E-04	2.06E-04	Jackknife
White Grunt-Reference Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.51E-06	5.00E-06	Jackknife
White Grunt-Reference Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	1.11E-06	1.71E-06	Jackknife
White Grunt-Reference Reef	Total Monochlorobiphenyl	3.71E-07	4.57E-07	Pivitol (t) Bootstrap
White Grunt-Reference Reef	Total Dichlorobiphenyls	3.09E-06	4.06E-06	Standard Bootstrap
White Grunt-Reference Reef	Total Trichlorobiphenyls	2.06E-05	3.00E-05	H-Statistic
White Grunt-Reference Reef	Total Tetrachlorobiphenyls	1.93E-04	3.95E-04	Jackknife
White Grunt-Reference Reef	Total Pentachlorobiphenyls	1.40E-03	2.71E-03	Standard Bootstrap
White Grunt-Reference Reef	Total Hexachlorobiphenyls	1.70E-03	2.80E-03	Standard Bootstrap
White Grunt-Reference Reef	Total Heptachlorobiphenyls	4.16E-04	5.61E-04	Jackknife
White Grunt-Reference Reef	Total Octachlorobiphenyls	1.57E-04	2.09E-04	Jackknife
White Grunt-Reference Reef	Total Nonachlorobiphenyls	7.41E-05	1.06E-04	H-Statistic
White Grunt-Reference Reef	209 - Decachlorobiphenyl	1.48E-05	1.96E-05	H-Statistic
White Grunt-Reference Reef	Total Polychlorinated Biphenyls	3.99E-03	6.86E-03	Standard Bootstrap
White Grunt-Target Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1.04E-02	1.56E-02	Standard Bootstrap
White Grunt-Target Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	6.73E-04	1.03E-03	Standard Bootstrap
White Grunt-Target Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	3.03E-02	4.69E-02	Standard Bootstrap
White Grunt-Target Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	3.35E-04	5.46E-04	Jackknife
White Grunt-Target Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	1.14E-05	1.33E-05	Standard Bootstrap
White Grunt-Target Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	4.46E-03	6.63E-03	Standard Bootstrap
White Grunt-Target Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.79E-04	1.30E-03	Standard Bootstrap
White Grunt-Target Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	1.60E-03	2.47E-03	Standard Bootstrap
White Grunt-Target Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	6.43E-06	5.40E-06	Standard Bootstrap
White Grunt-Target Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	3.41E-03	5.59E-03	Jackknife
White Grunt-Target Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.10E-02	1.81E-02	Jackknife
White Grunt-Target Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.74E-04	2.87E-04	Jackknife
White Grunt-Target Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	6.02E-05	9.73E-05	Jackknife
White Grunt-Target Reef	Total Monochlorobiphenyl	2.44E-06	3.57E-06	Jackknife
White Grunt-Target Reef	Total Dichlorobiphenyls	1.21E-04	1.74E-04	Jackknife
White Grunt-Target Reef	Total Trichlorobiphenyls	2.32E-03	4.16E-03	Jackknife
White Grunt-Target Reef	Total Tetrachlorobiphenyls	2.88E-02	4.77E-02	Jackknife
White Grunt-Target Reef	Total Pentachlorobiphenyls	1.08E-01	1.63E-01	Standard Bootstrap
White Grunt-Target Reef	Total Hexachlorobiphenyls	1.19E-01	1.91E-01	Jackknife
White Grunt-Target Reef	Total Heptachlorobiphenyls	3.07E-02	5.10E-02	Jackknife
White Grunt-Target Reef	Total Octachlorobiphenyls	1.21E-02	2.01E-02	Jackknife
White Grunt-Target Reef	Total Nonachlorobiphenyls	2.04E-03	3.18E-03	Jackknife
White Grunt-Target Reef	209 - Decachlorobiphenyl	8.05E-05	1.16E-04	Jackknife
White Grunt-Target Reef	Total Polychlorinated Biphenyls	3.03E-01	4.56E-01	Standard Bootstrap
Vermillion Snapper-Reference Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	1.65E-04	1.87E-04	H-Statistic
Vermillion Snapper-Reference Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	9.03E-06	1.02E-05	t-Statistic
Vermillion Snapper-Reference Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	4.72E-04	5.49E-04	H-Statistic
Vermillion Snapper-Reference Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	7.99E-06	9.04E-06	H-Statistic
Vermillion Snapper-Reference Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	3.01E-06	3.39E-06	t-Statistic
Vermillion Snapper-Reference Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	8.07E-05	9.19E-05	t-Statistic
Vermillion Snapper-Reference Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	2.20E-05	2.51E-05	H-Statistic
Vermillion Snapper-Reference Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	3.64E-05	4.28E-05	H-Statistic
Vermillion Snapper-Reference Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	5.69E-07	5.96E-07	Standard Bootstrap
Vermillion Snapper-Reference Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1.02E-04	1.26E-04	H-Statistic

Table 5-3
Exposure Point Concentrations
PCBs in Fish

Fish Group	Parameter	Average Concentration (mg/kg)	Calculated 95% UCL (mg/kg)	Statistical Method for 95% UCL Calculation
Vermillion Snapper-Reference Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2.94E-04	3.62E-04	H-Statistic
Vermillion Snapper-Reference Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.66E-06	6.45E-06	t-Statistic
Vermillion Snapper-Reference Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	6.81E-06	8.71E-06	Hall's t-Bootstrap
Vermillion Snapper-Reference Reef	Total Monochlorobiphenyl	8.28E-07	1.01E-06	Standard Bootstrap
Vermillion Snapper-Reference Reef	Total Dichlorobiphenyls	1.39E-05	1.56E-05	t-Statistic
Vermillion Snapper-Reference Reef	Total Trichlorobiphenyls	7.31E-05	8.61E-05	H-Statistic
Vermillion Snapper-Reference Reef	Total Tetrachlorobiphenyls	3.90E-04	4.62E-04	Standard Bootstrap
Vermillion Snapper-Reference Reef	Total Pentachlorobiphenyls	1.99E-03	2.27E-03	H-Statistic
Vermillion Snapper-Reference Reef	Total Hexachlorobiphenyls	3.03E-03	3.55E-03	H-Statistic
Vermillion Snapper-Reference Reef	Total Heptachlorobiphenyls	9.88E-04	1.17E-03	H-Statistic
Vermillion Snapper-Reference Reef	Total Octachlorobiphenyls	3.43E-04	3.87E-04	t-Statistic
Vermillion Snapper-Reference Reef	Total Nonachlorobiphenyls	1.22E-04	1.39E-04	t-Statistic
Vermillion Snapper-Reference Reef	209 - Decachlorobiphenyl	1.41E-05	1.78E-05	H-Statistic
Vermillion Snapper-Reference Reef	Total Polychlorinated Biphenyls	6.96E-03	8.02E-03	H-Statistic
Vermillion Snapper-Target Reef	105 - 2,3,3',4,4'-Pentachlorobiphenyl	4.64E-04	6.18E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	114 - 2,3,4,4',5-Pentachlorobiphenyl	2.64E-05	3.58E-05	Standard Bootstrap
Vermillion Snapper-Target Reef	118 - 2,3',4,4',5-Pentachlorobiphenyl	1.28E-03	1.73E-03	Standard Bootstrap
Vermillion Snapper-Target Reef	123 - 2',3,4,4',5-Pentachlorobiphenyl	1.79E-05	2.49E-05	Standard Bootstrap
Vermillion Snapper-Target Reef	126 - 3,3',4,4',5-Pentachlorobiphenyl	2.77E-06	3.72E-06	Standard Bootstrap
Vermillion Snapper-Target Reef	156 - 2,3,3',4,4',5-Hexachlorobiphenyl	1.51E-04	2.09E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	3.49E-05	4.67E-05	Standard Bootstrap
Vermillion Snapper-Target Reef	167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	6.00E-05	7.90E-05	Standard Bootstrap
Vermillion Snapper-Target Reef	169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	6.96E-07	1.01E-06	Standard Bootstrap
Vermillion Snapper-Target Reef	170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1.37E-04	1.96E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	3.82E-04	5.61E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.09E-06	7.92E-06	Standard Bootstrap
Vermillion Snapper-Target Reef	77 - 3,3',4,4'-Tetrachlorobiphenyl	6.73E-06	8.41E-06	Pivitol (t) Bootstrap
Vermillion Snapper-Target Reef	Total Monochlorobiphenyl	1.45E-06	1.65E-06	t-Statistic
Vermillion Snapper-Target Reef	Total Dichlorobiphenyls	1.76E-05	1.95E-05	t-Statistic
Vermillion Snapper-Target Reef	Total Trichlorobiphenyls	1.49E-04	1.64E-04	t-Statistic
Vermillion Snapper-Target Reef	Total Tetrachlorobiphenyls	1.42E-03	1.69E-03	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Pentachlorobiphenyls	6.17E-03	7.95E-03	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Hexachlorobiphenyls	5.29E-03	6.86E-03	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Heptachlorobiphenyls	1.30E-03	1.82E-03	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Octachlorobiphenyls	3.90E-04	5.35E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Nonachlorobiphenyls	9.33E-05	1.22E-04	Standard Bootstrap
Vermillion Snapper-Target Reef	209 - Decachlorobiphenyl	8.10E-06	1.06E-05	Standard Bootstrap
Vermillion Snapper-Target Reef	Total Polychlorinated Biphenyls	1.48E-02	1.91E-02	Standard Bootstrap

Table 5-4
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario
Navy REEFEX Program

	Estimated Non-carcinogenic Hazard:[1]							Estimated Carcinogenic Risk:					
Parameter	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**	**Cancer Slope Factor**	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**
Total Monochlorobiphenyl	0.000007	0.0000009	0.000004	0.000002	0.000003	0.000002	0.4	1.56E-11	2.00E-12	1.04E-11	4.06E-12	7.20E-12	4.41E-12
Total Dichlorobiphenyls	0.0003	0.000008	0.00006	0.000006	0.00004	0.00003	0.4	7.60E-10	1.77E-11	1.29E-10	1.32E-11	8.51E-11	6.81E-11
Total Trichlorobiphenyls	0.008	0.00006	0.0006	0.00003	0.0003	0.0002	2	9.08E-08	6.55E-10	6.79E-09	3.14E-10	3.58E-09	1.88E-09
Total Tetrachlorobiphenyls	0.09	0.0007	0.008	0.0004	0.003	0.0009	2	1.04E-06	8.62E-09	9.69E-08	5.13E-09	3.69E-08	1.01E-08
Total Pentachlorobiphenyls	0.3	0.005	0.04	0.002	0.02	0.004	2	3.56E-06	5.92E-08	4.37E-07	2.40E-08	1.74E-07	4.96E-08
Total Hexachlorobiphenyls	0.4	0.005	0.04	0.006	0.01	0.007	2	4.17E-06	6.11E-08	4.39E-07	7.44E-08	1.50E-07	7.75E-08
Total Heptachlorobiphenyls	0.1	0.001	0.01	0.004	0.003	0.002	2	1.11E-06	1.22E-08	1.20E-07	5.06E-08	3.97E-08	2.55E-08
Total Octachlorobiphenyls	0.04	0.0004	0.004	0.002	0.001	0.0007	2	4.39E-07	4.56E-09	5.06E-08	1.83E-08	1.17E-08	8.45E-09
Total Nonachlorobiphenyls	0.006	0.0002	0.01	0.0006	0.0002	0.0003	2	6.94E-08	2.31E-09	1.42E-08	7.14E-09	2.66E-09	3.03E-09
209 - Decachlorobiphenyl	0.0002	0.00004	0.0002	0.0001	0.00002	0.00003	2	2.53E-09	4.28E-10	1.79E-09	1.29E-09	2.31E-10	3.89E-10
Total Hazard/Risk[2]	0.9	0.01	0.1	0.02	0.04	0.02		1.05E-05	1.49E-07	1.17E-06	1.81E-07	4.19E-07	1.77E-07
Total Hazard/Risk[3]	1.0	0.01	0.1	0.02	0.04	0.02		1.15E-05	1.64E-07	1.28E-06	1.99E-07	4.61E-07	1.94E-07
Total Polychlorinated Biphenyls[4]	0.9	0.01	0.1	0.02	0.04	0.02	2	9.96E-06	1.50E-07	1.14E-06	1.77E-07	4.17E-07	1.75E-07
Total Polychlorinated Biphenyls[5]	1.0	0.01	0.1	0.02	0.04	0.02	2	1.10E-05	1.65E-07	1.25E-06	1.95E-07	4.59E-07	1.93E-07

[1]Reference dose based on Aroclor 1254 ($2.0x10^{-5}$ mg/kg/day)
[2]Fraction Ingested (FI) value assumed was 0.1
[3]FI value assumed was 0.11
[4]Differences between results for total polychlorinated biphenyls and summation of homologue groups are due to rounding differences as reported by the laboratory; FI value assumed was 0.1
[5]Same as footnote (4), but the FI value assumed was 0.11

Table 5-5
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario
Navy REEFEX Program

	Estimated Non-carcinogenic Hazard:[1]							Estimated Carcinogenic Risk:					
Parameter	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**	**Cancer Slope Factor**	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**
Total Monochlorobiphenyl	0.000001	0.0000002	0.000001	0.0000004	0.0000008	0.0000005	0.4	1.21E-12	1.84E-13	9.63E-13	3.65E-13	7.20E-13	4.11E-13
Total Dichlorobiphenyls	0.00007	0.000002	0.00001	0.000001	0.00001	0.000008	0.4	6.00E-11	1.53E-12	1.12E-11	1.24E-12	8.73E-12	6.90E-12
Total Trichlorobiphenyls	0.001	0.00001	0.0001	0.000005	0.0001	0.00004	2	5.76E-09	5.11E-11	5.83E-10	2.43E-11	3.70E-10	1.81E-10
Total Tetrachlorobiphenyls	0.02	0.0001	0.002	0.00006	0.0008	0.0002	2	7.15E-08	4.79E-10	8.16E-09	2.78E-10	3.52E-09	9.68E-10
Total Pentachlorobiphenyls	0.06	0.0008	0.008	0.0005	0.003	0.001	2	2.68E-07	3.47E-09	3.70E-08	2.09E-09	1.53E-08	4.94E-09
Total Hexachlorobiphenyls	0.07	0.0009	0.009	0.001	0.003	0.002	2	2.95E-07	4.22E-09	3.82E-08	6.03E-09	1.31E-08	7.52E-09
Total Heptachlorobiphenyls	0.02	0.0002	0.002	0.0008	0.0007	0.0006	2	7.62E-08	1.03E-09	1.03E-08	3.72E-09	3.23E-09	2.45E-09
Total Octachlorobiphenyls	0.007	0.00009	0.0007	0.0003	0.0002	0.0002	2	3.00E-08	3.90E-10	3.25E-09	1.55E-09	9.68E-10	8.51E-10
Total Nonachlorobiphenyls	0.001	0.00004	0.0002	0.0001	0.00005	0.00007	2	5.06E-09	1.84E-10	9.40E-10	6.33E-10	2.32E-10	3.03E-10
209 - Decachlorobiphenyl	0.00004	0.000008	0.00003	0.00003	0.000005	0.000008	2	2.00E-10	3.67E-11	1.49E-10	1.17E-10	2.01E-11	3.50E-11
Total Hazard/Risk[2]	0.2	0.002	0.02	0.003	0.008	0.004		7.52E-07	9.86E-09	9.86E-08	1.44E-08	3.67E-08	1.73E-08
Total Hazard/Risk[3]	0.3	0.003	0.03	0.004	0.011	0.006		1.05E-06	1.38E-08	1.38E-07	2.02E-08	5.14E-08	2.42E-08
Total Polychlorinated Biphenyls[4]	0.2	0.002	0.02	0.003	0.008	0.004	2	7.52E-07	9.90E-09	9.88E-08	1.45E-08	3.67E-08	1.73E-08
Total Polychlorinated Biphenyls[5]	0.3	0.003	0.03	0.004	0.011	0.006	2	1.05E-06	1.39E-08	1.38E-07	2.03E-08	5.14E-08	2.422E-08

[1]Reference dose based on Aroclor 1254 ($2.0x10^{-5}$ mg/kg/day)
[2]Fraction Ingested (FI) value assumed was 0.1
[3]FI value assumed was 0.14
[4]Differences between results for total polychlorinated biphenyls and summation of homologue groups are due to rounding differences as reported by the laboratory; FI value assumed was 0.1
[5]Same as footnote (4), but the FI value assumed was 0.14

Table 5-6
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario
Navy REEFEX Program

	Estimated Non-carcinogenic Hazard:[1]							Estimated Carcinogenic Risk:					
Parameter	White Grunt Target Reef	White Grunt Reference Reef	Black Sea Bass Target Reef	Black Sea Bass Reference Reef	Vermilion Snapper Target Reef	Vermilion Snapper Reference Reef	Cancer Slope Factor	White Grunt Target Reef	White Grunt Reference Reef	Black Sea Bass Target Reef	Black Sea Bass Reference Reef	Vermilion Snapper Target Reef	Vermilion Snapper Reference Reef
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.03	0.0006	0.003	0.0002	0.001	0.0004	15	2.55E-06	5.09E-08	2.52E-07	2.13E-08	1.01E-07	3.06E-08
114 - 2,3,4,4',5-Pentachlorobiphenyl	0.002	0.00004	0.0002	0.00001	0.00007	0.00002	75	8.43E-07	1.54E-08	8.35E-08	5.90E-09	2.93E-08	8.35E-09
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.09	0.002	0.01	0.0008	0.003	0.001	15	7.68E-06	1.44E-07	8.63E-07	6.83E-08	2.83E-07	8.99E-08
123 - 2',3,4,4',5-Pentachlorobiphenyl	0.001	0.00001	0.0001	0.00001	0.00005	0.00002	15	8.94E-08	9.56E-10	9.92E-09	8.61E-10	4.08E-09	1.48E-09
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.00003	0.000003	0.00002	0.000006	0.000007	0.000006	15000	2.18E-06	2.64E-07	2.06E-06	4.81E-07	6.09E-07	5.55E-07
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	0.01	0.0002	0.001	0.0002	0.0004	0.0002	75	5.43E-06	9.66E-08	5.20E-07	7.36E-08	1.71E-07	7.52E-08
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	0.002	0.00004	0.0003	0.00005	0.00009	0.00005	75	1.06E-06	1.83E-08	1.27E-07	1.97E-08	3.82E-08	2.05E-08
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	0.005	0.00008	0.0005	0.00007	0.0001	0.00008	1.5	4.04E-08	7.20E-10	4.26E-09	5.75E-10	1.29E-09	7.01E-10
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	0.00001	0.0000004	0.00001	0.000002	0.000002	0.000001	1500	8.84E-08	3.80E-09	9.23E-08	1.82E-08	1.65E-08	9.76E-09
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.01	0.0002	0.001	0.0004	0.0004	0.0002	15	9.15E-07	1.40E-08	9.96E-08	3.86E-08	3.21E-08	2.06E-08
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.03	0.0004	0.003	0.001	0.001	0.0007	1.5	2.96E-07	3.37E-09	2.46E-08	1.20E-08	9.19E-09	5.93E-09
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.0005	0.000009	0.00005	0.00002	0.00001	0.00001	15	4.70E-08	8.19E-10	4.06E-09	1.58E-09	1.30E-09	1.06E-09
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.0002	0.000003	0.00002	0.000004	0.00002	0.00002	75	7.97E-08	6.88E-09	1.06E-08	1.84E-09	6.88E-09	7.13E-09
Total Hazard/Risk[2]	0.2	0.003	0.02	0.003	0.007	0.003		2.13E-05	6.20E-07	4.15E-06	7.43E-07	1.30E-06	8.26E-07
Total Hazard/Risk[3]	0.2	0.003	0.02	0.003	0.008	0.003		2.34E-05	6.82E-07	4.57E-06	8.18E-07	1.43E-06	9.09E-07

[1]Reference dose based on Aroclor 1254 ($2.0x10^{-5}$ mg/kg/day)
[2]Fraction Ingested (FI) value assumed was 0.1
[3]FI value assumed was 0.11

Table 5-7
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario
Navy REEFEX Program

	Estimated Non-carcinogenic Hazard:[1]							Estimated Carcinogenic Risk:					
Parameter	White Grunt Target Reef	White Grunt Reference Reef	Black Sea Bass Target Reef	Black Sea Bass Reference Reef	Vermilion Snapper Target Reef	Vermilion Snapper Reference Reef	Cancer Slope Factor	White Grunt Target Reef	White Grunt Reference Reef	Black Sea Bass Target Reef	Black Sea Bass Reference Reef	Vermilion Snapper Target Reef	Vermilion Snapper Reference Reef
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.006	0.00009	0.0007	0.00006	0.0003	0.00009	15	1.94E-07	3.05E-09	2.25E-08	1.90E-09	8.64E-09	3.07E-09
114 - 2,3,4,4',5-Pentachlorobiphenyl	0.0004	0.000006	0.00004	0.000003	0.00001	0.000005	75	6.26E-08	9.29E-10	7.03E-09	5.25E-10	2.46E-09	8.40E-10
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.02	0.0003	0.002	0.0002	0.0007	0.0003	15	5.64E-07	8.91E-09	7.35E-08	5.90E-09	2.38E-08	8.78E-09
123 - 2',3,4,4',5-Pentachlorobiphenyl	0.0002	0.000003	0.00003	0.000002	0.00001	0.000004	15	6.23E-09	8.84E-11	8.56E-10	5.53E-11	3.33E-10	1.49E-10
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.000006	0.0000006	0.000004	0.000001	0.000002	0.000002	15000	2.12E-07	1.84E-08	1.36E-07	4.15E-08	5.16E-08	5.60E-08
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	0.002	0.00004	0.0003	0.00004	0.00008	0.00005	75	4.15E-07	5.96E-09	4.39E-08	5.91E-09	1.41E-08	7.51E-09
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	0.0005	0.000009	0.00007	0.00001	0.00002	0.00001	75	8.18E-08	1.57E-09	1.10E-08	1.64E-09	3.25E-09	2.05E-09
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	0.0009	0.00001	0.0001	0.00001	0.00003	0.00002	1.5	2.98E-09	4.78E-11	3.65E-10	4.76E-11	1.12E-10	6.77E-11
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	0.000004	0.0000001	0.000002	0.0000005	0.0000004	0.0000003	1500	1.20E-08	3.26E-10	5.92E-09	1.76E-09	1.30E-09	1.06E-09
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.002	0.00004	0.0003	0.00008	0.00008	0.00006	15	6.35E-08	1.20E-09	8.88E-09	2.77E-09	2.55E-09	1.90E-09
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.006	0.00009	0.0006	0.0002	0.0002	0.0002	1.5	2.05E-08	2.85E-10	2.16E-09	8.23E-10	7.11E-10	5.47E-10
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.01	0.000002	0.00001	0.000004	0.000003	0.000003	15	3.24E-09	6.53E-11	3.57E-10	1.18E-10	1.13E-10	1.05E-10
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.00003	0.0000006	0.000005	0.0000007	0.000004	0.000004	75	5.60E-09	1.03E-10	8.71E-10	1.10E-10	6.26E-10	6.34E-10
Total Hazard/Risk[2]	0.04	0.0006	0.004	0.0006	0.001	0.0007		1.64E-06	4.09E-08	3.13E-07	6.31E-08	1.10E-07	8.27E-08
Total Hazard/Risk[3]	0.06	0.0008	0.006	0.0009	0.002	0.0010		2.30E-06	5.73E-08	4.39E-07	8.83E-08	1.53E-07	1.16E-07

[1]Reference dose based on Aroclor 1254 (2.0×10^{-5} mg/kg/day)
[2]Fraction Igested (FI) value assumed was 0.1
[3]FI value assumed was 0.14

Table 5-8
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-carcinogenic Hazards for Homologue Groups
Reasonable Maximum Exposure Scenario
Navy REEFEX Program

		Estimated Hazard + Carcinogenic Risk:					
Parameter	**Cancer Slope Factor**	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**
Total Monochlorobiphenyl	4	1.56E-10	2.00E-11	1.04E-10	4.06E-11	7.20E-11	4.41E-11
Total Dichlorobiphenyls	4	7.60E-09	1.77E-10	1.29E-09	1.32E-10	8.51E-10	6.81E-10
Total Trichlorobiphenyls	4	1.82E-07	1.31E-09	1.36E-08	6.29E-10	7.16E-09	3.76E-09
Total Tetrachlorobiphenyls	4	2.08E-06	1.72E-08	1.94E-07	1.03E-08	7.38E-08	2.02E-08
Total Pentachlorobiphenyls	4	7.12E-06	1.18E-07	8.73E-07	4.80E-08	3.47E-07	9.91E-08
Total Hexachlorobiphenyls	4	8.34E-06	1.22E-07	8.78E-07	1.49E-07	3.00E-07	1.55E-07
Total Heptachlorobiphenyls	4	2.23E-06	2.45E-08	2.39E-07	1.01E-07	7.95E-08	5.11E-08
Total Octachlorobiphenyls	4	8.78E-07	9.13E-09	1.01E-07	3.66E-08	2.34E-08	1.69E-08
Total Nonachlorobiphenyls	4	1.39E-07	4.63E-09	2.84E-08	1.43E-08	5.33E-09	6.07E-09
209 - Decachlorobiphenyl	4	5.06E-09	8.56E-10	3.58E-09	2.57E-09	4.63E-10	7.77E-10
Total Hazard/Risk[1]		2.10E-05	2.98E-07	2.33E-06	3.63E-07	8.38E-07	3.54E-07
Total Hazard/Risk[2]		2.31E-05	3.28E-07	2.57E-06	3.99E-07	9.21E-07	3.89E-07
Total Polychlorinated Biphenyl[3]	4	1.99E-05	3.00E-07	2.28E-06	3.55E-07	8.34E-07	3.50E-07
Total Polychlorinated Biphenyl[4]	4	2.19E-05	3.30E-07	2.51E-06	3.91E-07	9.17E-07	3.85E-07

[1] Fraction ingested (FI) value assumed was 0.1
[2] FI value assumed was 0.11
[3] Differences between results for total polychlorinated biphenyls and summation of homologue groups are due to rounding differences as reported by the Laboratory; FI value assumed was 0.1
[4] Same as footnote (3), but the FI value assumed was 0.11

Table 5-9
Deterministic Risk Evaluation
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-carcinogenic Hazards for Homologue Groups
Average Exposure Scenario
Navy REEFEX Program

		Estimated Hazard + Carcinogenic Risk:					
Parameter	**Cancer Slope Factor**	**White Grunt Target Reef**	**White Grunt Reference Reef**	**Black Sea Bass Target Reef**	**Black Sea Bass Reference Reef**	**Vermilion Snapper Target Reef**	**Vermilion Snapper Reference Reef**
Total Monochlorobiphenyl	4	1.21E-11	1.84E-12	9.63E-12	3.65E-12	7.20E-12	4.11E-12
Total Dichlorobiphenyls	4	6.00E-10	1.53E-11	1.12E-10	1.24E-11	8.73E-11	6.90E-11
Total Trichlorobiphenyls	4	1.15E-08	1.02E-10	1.17E-09	4.85E-11	7.39E-10	3.63E-10
Total Tetrachlorobiphenyls	4	1.43E-07	9.58E-10	1.63E-08	5.56E-10	7.05E-09	1.94E-09
Total Pentachlorobiphenyls	4	5.36E-07	6.95E-09	7.39E-08	4.18E-09	3.06E-08	9.88E-09
Total Hexachlorobiphenyls	4	5.91E-07	8.44E-09	7.64E-08	1.21E-08	2.63E-08	1.50E-08
Total Heptachlorobiphenyls	4	1.52E-07	2.06E-09	2.07E-08	7.44E-09	6.45E-09	4.90E-09
Total Octachlorobiphenyls	4	6.00E-08	7.79E-10	6.50E-09	3.09E-09	1.94E-09	1.70E-09
Total Nonachlorobiphenyls	4	1.01E-08	3.68E-10	1.88E-09	1.27E-09	4.63E-10	6.05E-10
209 - Decachlorobiphenyl	4	4.00E-10	7.34E-11	2.98E-10	2.33E-10	4.02E-11	7.00E-11
Total Hazard/Risk[1]		1.50E-06	1.97E-08	1.97E-07	2.89E-08	7.37E-08	3.45E-08
Total Hazard/Risk[2]		2.11E-06	2.76E-08	2.76E-07	4.05E-08	1.03E-07	4.83E-08
Total Polychlorinated Biphenyl[3]	4	1.50E-06	1.98E-08	1.98E-07	2.89E-08	7.34E-08	3.45E-08
Total Polychlorinated Biphenyl[4]	4	2.10E-06	2.77E-08	2.77E-07	4.05E-08	1.03E-07	4.83E-08

[1]Fraction Ingested (FI) value assumed was 0.1
[2]FI value assumed was 0.14
[3]Differences between results for total polychlorinated biphenyls and summation of homologue groups are due to rounding differences as reported by the laboratory; FI value assumed was 0.1
[4]Same as footnote (4), but the FI value assumed was 0.14

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON

A Screening-Level Risk Evaluation of the Ecological and Human Health Risk of Using Former Naval Vessels to Construct Artificial Reefs on the Continental Shelf of the United States (SCREEN-EX) (SPAWAR, December 1999) and

Levels of PCBs and Heavy Metals in Biota Found on Ex-Military Ships Used in Artificial Reefs (SDNR 1998)

RESPONSE TO COMMENTS FROM MS. LAURA CASEY

Thank you for your comments; please find the responses next to each comment or question.

COMMENT	RESPONSE
A. Comments on SCREEN-EX proposal by Laura Casey, OPPTS	
1. Executive Summary, Background:	
PCB Bulk Product Waste is not regulated by TSCA but by the 40 CFR 761	Comment acknowledged. We agree that there is a difference between TSCA, the statute, and 40 CFR 761, the regulations promulgated under Section 6 of TSCA that regulate the manufacture, processing, distribution, and use of PCBs. References to regulations will be corrected in the introduction of the technical approach.
The technical corrections of June 24, 1999 only changed the title of 761.62(c) from "Risk-based cleanup approval" to "Risk-based disposal approval"...	Comment acknowledged. Until the title of 40 CFR 761.62(c) was changed, it was unclear to us whether the word "cleanup" applied to the Navy's proposed activity of using ex-military ships to build artificial reefs.
2. Section 2.0, Background:	
The second sentence should reflect this: "The U.S. EPA has stated that building reefs with ex-Navy vessels would be regulated as a PCB Bulk Product Waste under 40 CFR 761.62(c)	Comment acknowledged. The sentence will be modified.
Are there no other non-Navy studies or reports on this activities? What were they and why were they not relevant?	"Relevant studies" refers to studies that were specifically conducted to evaluate PCB levels and potential releases from former Naval vessels. While there are very many studies on the fate and effect of PCBs in the marine environment, no other studies are currently available that were performed to evaluate the fate or effect of PCBs from sunken Naval vessels.
I am not aware of any proposal [apparent regulatory approval] for the sinking of the Spiegel Grove.	Comment acknowledged. In past conversations with EPA in the Technical Working Group, we understood that there was a risk assessment process being conducted for the Spiegel Grove. The statement is based on information obtained from the Spiegel Grove web site (accessed in summer 1999) that the ship had been "cleared" for sinking "next spring". Currently (accessed on February 15, 2000), the web site indicates that the ship is awaiting cleanup before transit to Key Largo, Florida (www.spieglegrove.com).
The technical corrections of June 24, 1999 only changed the title ... to "Risk-based disposal approval...	Comment acknowledged. The paragraph will be corrected.

COMMENT	RESPONSE
3. Section 4.2, Modeling Study:	
Will your model take into account the effects of currents, tides and weather on a sunken ship...the possibility that a reef may attract more varieties and numbers of sea life and possibly expose a greater number of animals to exposure?	At this time, the model being developed for the Prospective Study takes into account the effect of average environmental conditions which are a function of current, tides, and weather. A sensitivity analysis will be performed to identify parameters that are key to the model. The model will represent a steady-state/equilibrium condition, which conservatively predicts PCB concentrations in broad functional groups. It takes into the effect of bioconcentration and biomagnification through the food chain in the ecosystem of a sunken-vessel artificial reef. As such, the model is capable of predicting the potential bioaccumulation of PCBs in each compartment of the food chain and will be representative of the types of sea life present on the reef. The model will not be able to model the abundance and distribution of organisms present on the reef.
4. Risk Characterization:	
Please provide sample calculations.	Risk characterization algorithms, parameters, and input values for the parameters will be provided in the Risk Assessment Work Plan. PCBs and other chemical of concerns (COC), if any, will be identified in the COC selection process.
5. Appendix A, A.1.1, Study Area:	
Please describe or provide more information on nonship artificial reefs.	As was presented by SCDNR in the March 1999 Technical Working Group Meeting, artificial reefs may be composed of many types of materials including concrete from bridge demolition projects, pre-fabricated concrete structures, as well as tires, armored military vehicles, etc.
Are you looking at cars, tires, tanks, planes, or concrete blocks?	For the screening level risk assessment only a sunken vessel reef (target site) and a natural reef (reference site) will be sampled; no additional types of artificial reefs will be sampled. The supplemental fish sampling being conducted for the human health assessment will entail collecting fish from both the target artificial reef and the reference reef. The selection of reference and target reefs described herein will be subject to review and approval by the Technical Working Group.
6. Appendix A, page 18, first paragraph:	
Please explain what you mean by "difference". How large or small must the difference be in order to require a human health risk assessment?	The PCB levels detected in fish caught in the target reef will be compared to those from the reference reef to determine whether there is a statistical difference between the data sets. For the Human Health Screening assessment, guidelines from the EPA Risk Assessment Guidance for Superfund (RAGS) will be followed. Specifically, the 95-percent upper tolerance limit (UTL) is developed using background data that provides, on average, 95 percent of the distribution with a probability of 95 percent. This UTL is the mean plus the product of a tolerance factor and the standard deviation. Depending on the data distribution, the mean is either arithmetic or a geometric mean. If the maximum PCB level detected in the target reef is below the UTL, it is unlikely that PCB concentrations at the target reef are higher than the reference reef. Further

COMMENT	RESPONSE
	evaluation, e.g., using an approach to detect a statistical significant and meaningful difference between the two populations. may be warranted if the UTL is exceeded. Any such statistical approach will be presented to the Technical Working Group for evaluation in the Risk Assessment Work Plan. If the UTL is exceeded and/or there is a statistically significant difference, the human health risk evaluation will proceed by: (1) a comparison of the maximum detected PCB concentration in fish from the target reef with the EPA published risk-based concentration (RBC) and, (2) performance of the screening risk assessment, if the RBC is exceeded.
Please explain how PCB may be removed during cooking.	There is much uncertainty about the effects of food preservation and cooking on PCB levels in fish. Several scientific studies (such as GLSFATF 1993, Puffer and Gossett 1983, Poston et al. 1991, Schecter et al. 1998, Sherer & Price 1993, and Zabic et al. 1979) have discussed the effects of cooking with respect to PCB concentrations in fish tissue. Potential loss mechanisms include loss of fats during broiling, or dissolution of PCBs in cooking oil. For the human health screening risk assessment, the high-end (formerly known as reasonable maximum exposure) exposure risk will not include the cooking reduction factor. Both the central tendency (average)-exposure risk and the probabilistic risk may include such a factor in the risk characterization. Details of the references used as input values for this factor would be provided in the Human Health Risk Assessment Work Plan.

B. Comments on SCDNR Study on PCBs in Biota Found at Artificial Reefs and SCREEN-EX proposal by Dr. Linda Phillips, Versar, Inc.

Thank you for your comments, please find responses next to each question or comment.

SCDNR Document	
1. The FDA action level of 2 ppm may not be a risk-based value that would be considered protective of human health....an RBC of 0.005 mg/kg (ppm) ..is considerably lower (i.e., 400 times) than the FDA action level of 2.00 ppm.	Comment acknowledged. Because of this concern, the SCDNR Study will only be used to evaluate human health risk qualitatively. (Please note that the SCDNR Study was not intended to be a risk assessment) Under SCREEN-EX, if the PCB levels in the target reef site exceed the background PCB level, a baseline risk assessment (BRA) will be performed using a methodology consistent with the EPA's Risk Assessment Guidance for Superfund (RAGS). Region-specific (South Atlantic Coastline) fish ingestion rate and other region- or site-specific input values will be used to characterize the individual excess lifetime carcinogenic risk and non-carcinogenic hazard.
2. Detection Limits: This detection limit (10 ppb or 0.01 ppm) may not be adequate to detect risks... it may be difficult to say with certainty that non-detects represented "no risk" levels.	Comment acknowledged. The SCDNR Study will only be used to evaluate human health risk qualitatively. The analytical method used to quantify PCB levels in fish under SCREEN-EX (Modified EPA Method 1668 or an equivalent method) will have detection limits in part per trillion (ppt) levels that are lower than EPA's calculated risk-based concentration (RBC). For some fish samples, a SIM method will be used, with a DL of 2.0 ppb.

COMMENT	RESPONSE
It is not clear... whether samples were analyzed on a whole weight or lipid weight basis.	The data were presented as wet-weight concentrations..
It may have been possible to achieve lower detection limits by analyzing the samples based on extracted fats.	Detection limits were considered in selection of an appropriate analytical method for additional proposed sampling. EPA Draft Method 1668 or equivalent method will be used to extract and analyze PCBs in fish collected under SCREEN-EX. Lipid content will also be measured in the fish fillet samples collected. For some fish samples, a SIM method will be used, with a DL of 2.0 ppb.
3. Likelihood of PCB onboard of Sunken Vessels: The text seems to imply that although PCBs were not confirmed on these ships, it does not mean they may not be there. Thus evaluating for significance differences between these ships and those confirmed to have PCBs may not be very meaningful.	Comment acknowledged. There is a likelihood that PCBs may have been present even if they were not confirmed. The assumption is that if PCBs are being released from the ship then the biota sampled near the ship would be more likely to have higher concentrations than fish sampled from areas where PCBs are not being released (for example a natural reef). Because of this concern, the SCDNR Study will only be used to evaluate human health risk qualitatively. The problem is that there is no reliable record on the mass or loading of PCB in any of the currently sunken vessels. That is why the Navy is proposing a three--pronged approach: (a) screening of existing data to evaluate potential ecological risks, (b) collection of fish data from a reference reef and a sunken vessel artificial reef to evaluate potential human health risks (as appropriate, the SCDNR data may be used to provide qualitative support in the human health risk assessment), and (c) development of a Prospective Model to evaluate the potential risks from hypothetical releases of PCBs.
Fish move about, and the location of those captured may have little to do with where they are exposed.	A reef is an ecosystem with various trophic levels and biological organizations. Some fish will move, while others will remain at a single reef. This is dependent on individual species characteristics and factors such as the proximity of sunken vessel artificial reefs to other reefs. The selected target species will be identified in the Human Health Risk Assessment Work Plan.) These species will be common members of the reef community, generally territorial, and prized by anglers as fish to be caught for consumption. Since the target fish dwells at or near a sunken vessel artificial reef, it could be exposed to PCBs originating from the vessel (through leaching), resulting in direct exposure (water) and indirect exposure (food-chain diet).
4. A better comparison would be to sample bivalves from vessels with known PCB contamination and compare them to samples from "background" sites where PCBs are not found.	Comment acknowledged. This will be taken into consideration when developing any future sampling designed to evaluate ecological risk.
5. How were the PCB average concentrations calculated... were non-detects set to one-half the detection limit for these calculations, or were non-detects set to zero?	In the SCDNR study non-detected values were assumed to be zero. Therefore, the SCDNR study will only be used qualitatively in our overall human health risk assessment approach. For the health risk assessment, non-detects and any data comparability issues will be handled in accordance with Guidance for Data Usability in Risk Assessment (Part A) (EPA 1992).

COMMENT	RESPONSE
6. I am concerned that the studies [referenced studies of Atlantic Coast finfish and mollusks] ..Are these the most recent data that could be used as a source of "background data"?	Comment acknowledged. Because of this concern, the SCDNR Study will only be used to evaluate human health risk qualitatively. More recent studies, as appropriate, will be referenced and summarized in the screening level risk assessment.
COMMENTS ON SCREEN-EX PROPOSAL FROM DR. LINDA PHILLIPS Thank you for your comments, please find responses next to each question or comment.	
1. It would be useful to summarize the proposed strategy in a number of bullets at the beginning of the document and relate the proposed data collection to components of the strategy to which they apply.	Comment acknowledged. The SCREEN-EX project consists of three components (1) screening for potential ecological risks using existing data, (2) conducting fish sampling to evaluate potential human health risks, and (3) developing a prospective model to evaluate potential risk from hypothetical PCB releases. Our approach under SCREEN-EX for evaluating human health is to: • Collect fish tissues from an artificial reef (preferably the ship from the SCDNR study with the highest PCB concentrations in biota) and a reference natural reef • If there is no statistical difference between these two sources, no further evaluation will be performed • If PCBs in fish from the artificial reef exceed those from the background reef, the tissue concentrations will be compared to generic (Region III) fish tissue RBCs to determine if a risk evaluation is warranted • If tissue concentrations are below the RBCs, no further evaluation will be performed. • If at this point PCBs in fish from the artificial reef exceed both background levels and RBCs, then a screening risk assessment will be performed according to RAGS guidance to estimate risks and hazards. The strategy for the ecological risk component of SCREEN-EX is presented below: • Conduct problem formulation, including a conceptual model, for ecological receptors and functional groups. • Identify benchmarks of ecological effects for species representative of the groups. For water exposure, the benchmark would be set to chronic water quality criteria (e.g. Criterion Continuous Concentrations identified in EPA 822-Z-99-001), for sediment the benchmarks would correspond to applicable sediment ecotox thresholds (e.g. EPA 540/F-95/038, 1996), and for dietary uptake the benchmarks would correspond to the dose that is equivalent to the NOAEL for the receptor

COMMENT	RESPONSE
	species for the proposed assessment endpoints (for example, avian omnivores, avian piscivores, and marine mammals). • As appropriate and after sufficient data have been identified, develop estimates, based on existing data, of contaminant concentrations (C) in exposure media (water, sediment, diet) for (i) artificial reefs composed of former Navy ships, (ii) artificial reefs composed of materials other than former Navy ships, (iii) natural reefs, and (iv) regional background. Calculate ecological hazard quotients and ecological hazard indices (as appropriate) for representative species using the estimates of exposure media associated with artificial reefs composed of former Navy ships and the benchmarks for each assessment endpoint and complete exposure pathway. • Compare estimates of exposure associated with artificial reefs composed of former Navy ships to estimates of exposure associated with (ii) artificial reefs composed of materials other than former Navy ships, (iii) natural reefs, and (iv) regional background. Document and discuss sources of uncertainty and identify data gaps.
2. Screening Level Equations: Ecological screening equations Section 4.3 should be modified to use standard risk assessment nomenclature...should clearly define inputs to these equations. The NOAELs mentioned here are species-specific...would be used if doses to predatory birds were calculated.	Comment acknowledged. The equations and parameters used to calculate ecological hazard quotients and hazard indices will be presented and clearly defined in the ecorisk work plan.
For the human health assessment, the equations should be revised as follows: HEQ = C/RBC Where: HEQ = health effects quotient C = concentration in fish or sediment (mg/kg), water (mg/L), or surfaces (mg/cm^2)	The screening risk assessment, in the form of a baseline risk assessment (BRA) for the fish ingestion exposure pathway, rather than the HEQ screening risk assessment as suggested by the commenter, will be performed. This BRA will be necessary if the maximum detected PCB level in finfish collected at the target sunken vessel reef exceeds the UTL for PCB in finfish collected at the reference location and also exceeds the EPA published RBC for the fish ingestion pathway for PCB. The baseline risk assessment will characterize the individual excess lifetime carcinogenic risk as well as the noncarcinogenic hazard. The risk and hazard will be calculated using the equations provided in RAGS.
RBCs for fish ingestion are published by several EPA Regions (which Region's values will be used?)	The EPA published RBC will be presented in the Human Health Risk Assessment Work Plan. At this time, The EPA Region III RBC is being considered.
Published RBCs are not available for water and sediment contact....these RBCs would have to be developed.	The fish-ingestion RBC will be used for screening before the BRA is performed. There is no plan to develop non-published RBCs. The plausibility of exposure to PCBs through dermal contact will be evaluated in the workplan and the exposure assessment

COMMENT	RESPONSE
	and uncertainty section of the SCREEN-EX report. RAGS and the EPA Administrator's guidance (EPA Risk Characterization Program - Carol Browner [1995]) require that plausible exposure pathways be identified and recommend that professional judgment, along with site conditions and chemical fate characteristics, be used to identify significant pathway(s) for the BRA.
The terms HI and HQ are used mostly in human health risk assessments for noncarcinogens...The term EEQ would be better for ecological ...	Comment acknowledged. The ecological effects benchmarks (NOAELs, Water Quality Criteria, or other toxicological effect thresholds) will be compared to the estimated dose or environmental exposure that could occur. The benchmarks are thresholds that, when exceeded, have been associated with causing ecological effects. The EEC will be derived from NOAELs, Water Quality Criteria, or other toxicological effect thresholds as appropriate. To assess the potential for ecological risk, an ecological hazard quotient will be calculated for representative species for a given exposure pathway, where the quotient is the ratio between the potential exposure level (concentration or dose) and the ecological effects criterion (EEC). The term ecological hazard quotient and ecological hazard index (as appropriate) will be used in future reports related to this project to avoid confusion.
3. Section A.1.1 {Appendix A]...does not describe the media to be sampled. I assume that water, sediment, and fish will be sampled. ... Surface data will be needed to assess risks from contact by divers.	The screening exercise for ecological risk evaluation will be based on existing information. The only additional sampling currently planned at the screening level is to collect finfish fillet data in support of the human health risk assessment. One of the objectives of the screening will be to determine what additional data in what media are needed to address risk and uncertainty. As discussed in our response to a previous comment, for the human health risk assessment, the collection of water, sediment, and reef surface data are not planned because dermal exposure of PCB through these media is expected to be low. The SCREEN-EX report(s) will provide additional details and rationale for our judgment.
4. In section A.1.3, the types of PCB measurements are outlined. Will samples be analyzed for Aroclors too? Published RBCs are based on Aroclors.	Samples will not be analyzed for Aroclors. Total PCB values will be obtained by summing the results from quantifying mono- through deca-chlorinated congeners based on Modified EPA Method 1668 or an equivalent method. Total PCB will be used to compare with the RBC or derive exposure intake for characterizing the individual excess lifetime carcinogenic risk and hazard quotient for the fish ingestion pathway in the BRA. It is acknowledged that there are two RBCs (one for Aroclor 1016 and one for other Aroclors) provided by EPA Region III. As a conservative approach, we intend to use the lower of the two RBCs for screening. Similarly, in characterizing noncarcinogenic hazard in the BRA, the reference dose (RfD) with a lower value (between two available RfDs) will be used.
5. Section A.1.4 states that recreational divers will be evaluated....How will this dermal RBC be developed? Should dermal absorption from water and incidental ingestion of water also be considered.	Dermal RBC and dermal hazard and risk will not be derived or calculated for this screening exercise. As discussed above, the plausibility of a dermal pathway will be discussed in the Human Health Risk Assessment Work Plan and the exposure assessment and uncertainty section of the SCREEN-EX report. It will provide the rationale for identifying significant and insignificant exposure pathways. If the BRA

COMMENT	RESPONSE
	indicates that risk or hazard is marginally below the EPA points of departure (after other uncertainties associated with the fish ingestion exposure pathway have been addressed), such a pathway and the incidental surface water ingestion pathway may be proposed for evaluation. In this case, the approach, including dermal transfer factor of PCB in the aquatic environment, will be proposed for evaluation by the Technical Working Group.
6. Section A.1.4 also discusses the ecological receptor species, but it is not clear how the data for these species will be used....Will these species be evaluated in terms of risk (i.e., EEQs)....I believe water and sediment data will be needed; not fish data...Will these data be used to calculate a dose to predatory birds for comparison to NOAELs?	The general approach for screening direct and indirect (ingestion) pathway exposures was discussed in response to comment No. 1. At the screening level, only generic and broad assessment endpoints will be applied. Either measured or estimated fish tissue concentrations (by application of bioconcentration factors BCFs, FCMs, or other modeling approaches to estimate concentrations in food items such as fish) will be used for ingestion pathway exposures. For direct exposures, modeling techniques will be used to estimate concentrations in water and sediment in the absence of empirical data. The EEQ method will be followed. Fish fillet data will be collected under SCREENEX in support of the human health screening. Because these data will be collected for higher trophic level fish (e.g., groupers, which are relatively territorial), these data should also provide an indication of the relative contribution of background PCB levels (or lack thereof) in the context of assessing ecological concerns, e.g., avian species and marine mammals. However, it should be noted that this is only a qualitative comparison, since the actual mass of PCBs on the sunken ship(s) selected for evaluation is unknown. This is an uncertainty to be evaluated in the Prospective Study. The ultimate goal of the screening exercise is to identify whether sunken ships currently known to contain PCBs are contributing to unacceptable ecological or human health risks.
7. In selecting receptor species to be used in the comparative analyses, it would be best to select species that ...are relatively immobile so that the PCB concentrations observed in their tissues are not confounded by exposures from non-site-related areas.	Comment acknowledged. The only data that will be statistically sufficient for quantitatively comparing a reference area to an existing sunken ship will be fish fillet data collected in support of the human health screening. The current plan includes collection of two fish species that are generally territorial and long-term reef residents. For species used in the ecological screening evaluation, the same approach will be applied, i.e., relatively immobile or non-migratory biota collected in the SCDNR study will be used in the comparative analyses.
8. Section A.1.4 - 3rd from the last paragraph...It is unclear what criterion will be used in determining whether a human health risk assessment...should be conducted...Also what is meant by "no difference" in this paragraph.	The criteria for conducting the human health risk (deterministically and probabilistically) will be: (1) there is a basis for a statistically significance difference, such as an exceedance of the maximum detected PCB level in finfish collected from the target sunken vessel reef above the UTL of PCB in finfish collected from the reference reef, and (2) if an exceedance exists the maximum detected level also exceeds the RBC for the fish ingestion pathway. Please refer to our response to comment No. 6 offered by Ms. Laura Casey regarding the meaning of "difference."

COMMENT	RESPONSE
9. The importance of bioconcentration should be addressed if fish tissue concentrations are to be modeled from PCB loadings and subsequent water/sediment concentrations.....effects may occur in higher trophic level organisms, such as birds that eat the fish.	Comment acknowledged. Please note that higher trophic levels are included as assessment endpoints for the ecorisk assessment. In the absence of PCB concentrations in specific dietary items that are considered important to the screening evaluation, appropriate BCFs and FCMs (or other modeling approaches) will be applied. Bioaccumulation will also be addressed by the Prospective Study discussed in Section 4.2 of the proposal. Please also see responses to Comments Nos. 2 and 6.

References on Cooking Reduction Factors:

GLSFCA. 1993. Uniform Great lakes Sport Fish Consumption Advisory. Appendix II Reduction in Lipophilic Chemicals as a Consequence of Sport Fish Preparation and Cooking Advice, in Protocol for a Uniform Great lakes Sport Fish Consumption Advisory. Great Lakes Sport Fish Advisory Task Force.

Poston, T.M., G.S. Durell, B. Koczwara, and A.M. Spellacy, 1991. Effects of cooking on levels of PCBs in the fillets of Winter Flounder (Pseudopleuronectes americanus), Pacific Northwest Laboratory, Richland, WA

Puffer, H.W. and R.W. Gossett. 1983. PCB, DDT, and benzo(a)pyrene in raw and pan-fried white croaker (Genyonemus lineatus). Bull. Environ. Contam. Toxicol. 30:65-73.

Schecter, A.J., O. Papke, and M. Dellarco. 1979. Dioxin, dibenzofuran, and PCB congeners in cooked and uncooked food. 1997. Presented at Dioxin '97, 17th International Symposium on Chlorinated Dioxins and Related Compounds, held August 25-29 in Indianapolis, IN. Shor paper in Organohalogen Compounds, Volume 33:462-466.

Sherer, R.A., and P.S. Price. 1993. The effect of cooking processes on PCB levels in edible fish tissue. Quality Assurance: Good Practice, Regulation, and Law. Vol. 2(4): 396-407.

Zabik, M.E., P. Hoojjat, and C.M Weaver. 1979. Polychlorinated biphenyls, dieldrin and DDT in lake trout cooked by broiling, roasting or microwave. Bull. Environ. Contam. Toxicol. 21:136-143.

EX-USS VERMILLION PCB HUMAN HEALTH RISK ASSESSMENT PROJECT

STUDY SITES

Vermillion Artificial Reef:

Background - This site is comprised of a permitted manmade reef consisting of a single sunken ex-U.S. Navy ship hull. The reef was constructed in August 1988 by the South Carolina Department of Natural Resources (SCDNR) as part of its Marine Artificial Reef Program. The ex-USS Vermillion (LKA-107) was obtained by the State of South Carolina in 1987 from the U.S. Maritime Administration's inactive reserve fleet in the James River near Ft. Eustis, Virginia. The 460 foot-long (139m) ship was towed to Wilmington, North Carolina where it was cleaned, stripped and prepared for its new role as reef material by a private marine contractor and ship breaker.

The vessel was prepared to acceptable standards at that time (Stone, 1985) for all such artificial reef construction activity in the U.S. All commonly encountered potential shipboard pollutants such as fuels, oils, solid or liquid chemicals, liquid PCBs (electrical transformers and switchboards) and floatable materials such as plastics or wood were removed and properly disposed of by the contractor. To facilitate use of the ship in 110 feet of water and minimize its risk as a possible hazard to navigation, the overall height of the vessel was reduced to no greater than 55 feet (17m) above the keel. All structure above the O-1 level was removed. Large holes were cut in the sides of the ship and between watertight bulkheads. Internal watertight integrity was further breached by removing or welding open internal doors and hatches. After final inspection by U.S. Coast Guard Marine Safety Office Wilmington, the vessel was towed to its final destination and sunk by the use of explosive charges set by U.S. Navy Explosive Ordnance Disposal personnel (EOD Mobile Unit Six). The Vermillion sank quickly, and settled in an upright position on barren flat sand bottom 110 feet (33m) deep, approximately 32 nautical miles southeast of the port of Georgetown, SC.

As with similar artificial reef structures utilized off the state (Bell, 1991; Bell and Martore, 1999), the Vermillion began a rapid transformation into a living hard bottom reef community, with colonization of commonly occurring invertebrate and vertebrate species taking place within days of its sinking. Within a matter of several months the Vermillion Reef had become a popular recreational diving and fishing destination for local citizens and tourists (Rhodes, et al., 1994). In September 1989, the ship was displaced approximately 700 feet (212m) west of its initial location during intense storm surge from hurricane Hugo (Bell and Hall, 1994). As a result of this process significant scouring around the hull resulted in a subsidence of the ship through the sandy sea floor and well into the underlying marl formations, resulting in a new maximum depth on the reef site in excess of 135 feet (41m). Deep scouring around the ship was contained to within approximately 50 feet (15m) of the vessel, with the surrounding sand bottom maintaining its previous 110 (33m) foot depth.

Site Characterization - The Vermillion lies on a northerly heading at 32° 57.525' N, 078° 40.041'W (approximate center of ship), in the southwestern corner of the permitted reef area. The ship is structurally intact with no visible signs of significant deterioration to the hull, superstructure, decks or major structural members. The vessel has a slight starboard list, with the maximum depth at the stern being approximately 10 feet (3m) deeper overall than the maximum depth at the bow. The highest point of the ship is a small section of the forward port side O-2 level deck (78 feet (23.6m) deep). The deepest part of the main deck is the starboard side stern area (115 feet (35m) deep). Continual scouring around the vessel maintains an area of exposed marl, which adds to the overall footprint of the hard bottom reef. At some points the water depth in this region immediately around the ship approaches 140 feet (42.4m) or greater.

After eleven years on the ocean floor, a well-developed marine epibenthic community has been established on the exposed vertical and horizontal surfaces of the ship. Much of the main deck and O-2 level deck is covered with patches of attached mollusks (*Arca sp, Pteria colymbus* and *Crepidula sp*), barnacles (*Balanus sp*), hard coral (*Oculina arbuscula and Astrangia sp*) and, and a broad coating of hydroids, bryozoans, tunicates, polychaete worms, encrusting sponges, algae and some octocorals (*Leptogorgis sp* and *Lophogorgia sp*). As observed in an earlier study of sessile biota on ship hull artificial reef structures off South Carolina (Wendt, et al., 1989), large sponges and corals commonly encountered on natural hard bottom habitats are absent on the ship, with significant coverage of exposed areas being from predominately less erect species from a variety of taxa. Both starboard and port sides of the Vermillion are thoroughly colonized by the same sessile species encountered on the horizontal surfaces, but with a visibly higher percentage of overall coverage and greater density of organisms. Octocorals (*Lophogorgia sp*) observed on the sides of the vessel also occur more frequently and are represented by much larger specimens than those found on horizontal surfaces such as the main deck. Wendt, et al. (1989) observed a similar trend of significantly greater biomass, percent cover and number of sessile species on vertical surfaces of ship reefs of varying ages when compared to horizontal surfaces on the same vessels.

A variety of motile invertebrate species were observed on the Vermillion, but it proved much harder to gain a sense of their overall community structure and significance due to their low density and cryptic nature. Many of the species encountered are known to be predators on sessile fouling organisms (Harris and Irons, 1982). Several species of gastropods were encountered on horizontal and some vertical surfaces, including *Cymatium pileare, Pleuroploca gigantea, Cypraea cervus* and *Terebra dislocata.* Most were seen on the main deck of the ship, with T. dislocata observed in the greatest number, occurring in several small clusters of multiple individuals. Several specimens of the motile bivalve *Nodipecten nodosus* were observed on the main deck of the ship as well. Other motile invertebrates encountered included numerous species of echinoderms (Asteroidea, Echinoidea, Ophiuroidea and Holothuroidea), one octopus, and several specimens of readily observable decapods (*Scyllarides nodifer, Petrochirus sp* and *Pagurus sp*). Internal spaces of the ship easily observable to divers appeared to have very diminished populations of motile or sessile invertebrates, although barnacles and some mollusks were noted immediately inside most hatches and doorways.

As a result of fishing activities and diver observations, 42 species of fishes representing 19 families were found to occur on the Vermillion Reef (Table 1). The species encountered are typical of those expected to occur on manmade reefs in a comparable depth of water off South Carolina (Bell, 1991), and are equally as likely to be represented in fish assemblages documented on and around naturally occurring hard bottom reef communities off the southeastern U.S. (Barans and Henry, 1984; Sedberry and Van Dolah, 1984; Wenner and Sedberry, 1989). Many of the demersal and pelagic fish species observed on the reef are typically targeted and landed by recreational and commercial fishermen on either manmade or naturally occurring hard bottom areas (Huntsman, 1976; Low and Waltz, 1988; Low, 1999). Based on estimated and measured sizes of fishes observed or captured around the ship it is apparent that a wide range of year groups of many of the demersal fish species closely associate with hard bottom reef structure such as the Vermillion at any given time. The important role played by hard bottom habitat (manmade or naturally occurring) has been documented for many of the species encountered in examinations of their life histories and movement patterns (Waltz, et al.,1982; Low and Waltz, 1991; Padgett, 1997; Potts, et al., 1998).

Hard Bottom Reference Site:

Background – This site consists of a relatively small area of naturally occurring hard bottom or "live bottom", developed on a low to moderate relief, intermittent rocky outcropping located approximately 3.9 nautical miles west of the Vermillion Reef. The site was originally discovered by SCDNR biologists during a 1990 side scan sonar survey conducted to relocate the Vermillion following hurricane Hugo. Hard bottom of this type is common in small patchy locations in this general region, and commercial and recreational fishermen have taken advantage of its productivity for years. Descriptions of hard bottom reef habitat, its distribution along the southeastern U.S. and its critical role in the life histories of many key reef fish species can be found in the South Atlantic Fishery Management Council (SAFMC) Essential Fish Habitat Management Plan (1998). In an earlier examination of potential PCB uptake in biota found on ex-military vessels off South Carolina this specific site was used as one of three hard bottom reference sites along the coast (Bell, et al., 1997).

Site Characterization - The study reference area is approximately 100 feet (30m) wide (east-west axis) by 600 feet (182m) long (north-south axis) with a center point of 32° 57.228'N, 078° 44.663'W. Water depths in the area range from 95 to 105 feet (28.8m to 31.8m), with the majority of the bottom in this area consisting of a broad pattern of blocky, irregular rock out-crops with sand between the joints and cracks. One section of moderately stepped scarp (8 feet (2.4m) of relief) exists near the center of the area, and extends almost continuously for approximately 150 feet (45.5m) along the north-south axis. The reference area itself is only a small portion of a much larger wide-spread geologic formation of exposed Pleistocene to Pliocene rock which occurs intermittently in offshore waters along the southeastern U.S. from Florida to North Carolina (Continental Shelf Associates, Inc, 1979).

Geological and biological characterizations of hard bottom reefs along the U.S. East Coast identical in nature to the reference area have been completed by numerous researchers (Henry, 1978; SCW&MRD, 1984). Epibenthic invertebrate communities (Wenner, et al., 1983; Wenner, et al., 1984) and groundfish assemblages (Grimes, et al., 1982; Sedberry and Van Dolah, 1984; Barans and Henry, 1984) occurring at several similar hard bottom habitat sites off South Carolina have been described in detail. A clear picture of the importance of reef fish communities found on such sites to both commercial and recreational fisherman can be established through an examination of present and past fishing practices and results (Chester, et al., 1984; Rhodes, et al., 1994; Low, 1999).

The epibenthic invertebrate community on this site is similar in some respects to that present on the Vermillion Reef, but much older, more developed and more species rich overall. Obvious differences exist due simply to the physical characteristics of the substrates involved (rock versus steel; complex versus simple), their dimensions (8 feet (2.4m) versus 55 feet (17m) of relief) and their ages (thousands of years versus 12 years). Sessile species such as barnacles, hyroids, bryozoans and mollusks, found to be initial colonizers on manmade reef structures (SCW&MRD, 1984; Wendt, et al., 1989), were present on the natural rocky hard bottom site, but appeared to play a less dominant role in the coverage of primary space. Large basket sponges, stony corals (*Oculina arbuscula* and *Astrangia sp*) and octocorals (*Lophogorgia sp*) were easily detectable throughout the site, and several species of algae were thick in broad expanses on flat low relief rock and in sandy areas. Organisms such as worms or sponges capable of boring into the rock for protection or attachment could be found on this type substrate and not on the Vermillion. A few bivalves (*Arca zebra* and *Pteria colymbus*) were located, although well camouflaged and extremely difficult to detect without very close scrutiny.

Due to the complex bottom topography of this rocky hard bottom area, motile invertebrates were much harder to detect than those found on a manmade reef structure such as the Vermillion. An abundance of crevices, overhangs and holes in the marl formations provide abundant areas for more cryptic species to reside. Despite this, several gastropods (*Pleuroploca gigantea*, *Cymatium pileare*, *Fasciolaria sp* and *Oliva sayana)*, numerous echinoderms (primarily urchins), octopus, several lobster (*Scyllarides nodifer*) and several hermit crabs (*Pagurus sp)* were observed. None were observed in great numbers during the course of an individual dive on the reef.

Forty species of fishes representing 23 families were observed on this site during the course of the study (Table 2). Most were commonly encountered demersal or pelagic species typically associated with hard bottom reef habitat off the state (Sedberry and Van Dolah, 1984), with 67.5% of them being in common with species detected on the Vermillion Reef during the study period. Overall fish density on the site appeared to be significantly less than that experienced on the smaller manmade reef, although more sub-legal size grouper were seen in total on one dive in this area than on the entire Vermillion Reef in several dives. Despite lower fish density, fishing activity on the site proved to be far more productive, with much higher catch per unit of effort for targeted and other species than that experienced on the Vermillion Reef.

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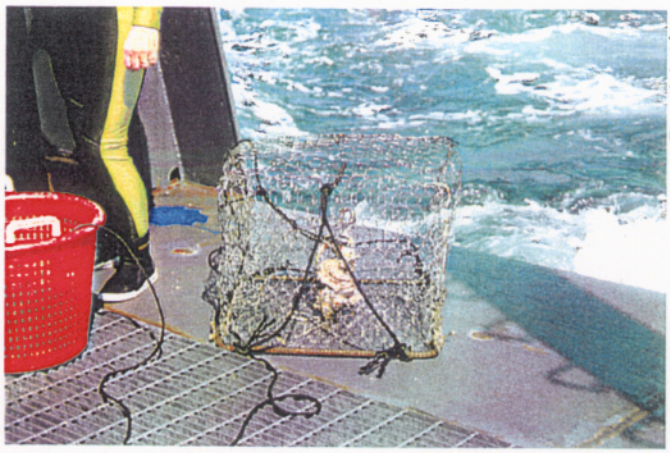
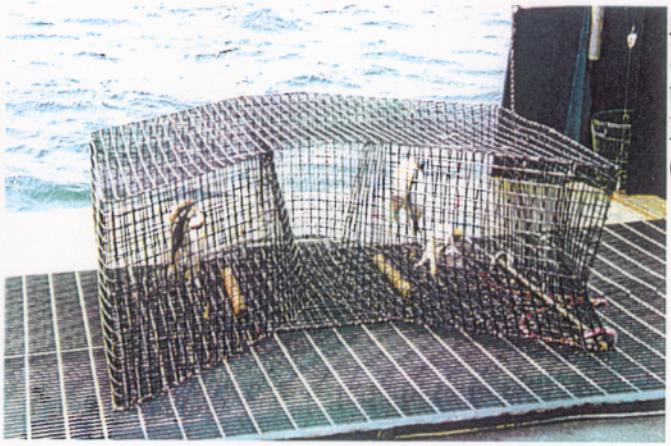
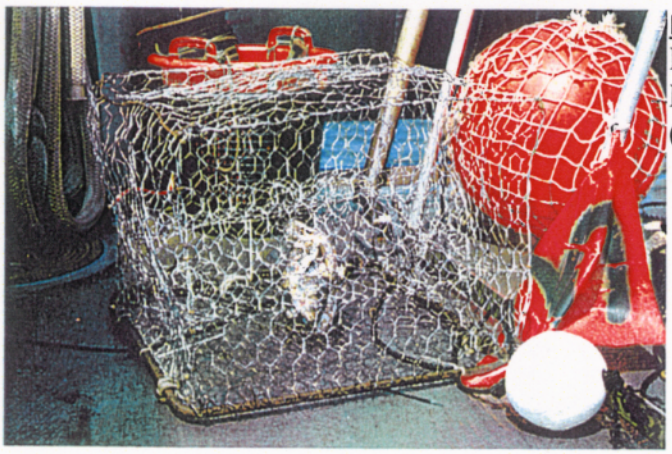
Photgraphs - Fish Traps Used in the Fish Sampling Program .



PHOTOGRAPH 1.:
Baited Crap Trap, modified and baited for Black Sea Bass
(Reference No. 7-4A)

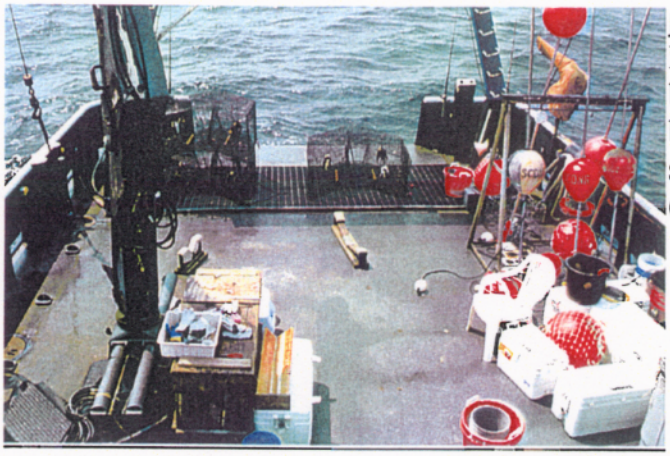


PHOTOGRAPH 2.:
Baited Chevron Trap used for trapping Grouper and Black Sea Bass (close view)
(Reference No. 16-13A).



PHOTOGRAPH 3.:
Baited Black Sea Bass Trap (same as Photo 1)
(Reference No. 018-15A)

Photgraphs - Fish Traps Used in the Fish Sampling Program



PHOTOGRAPH 4.:
Baited Chevron Trap at rear of the boat deck ready to be deployed. Red buoys and coolers are shown on the side of the boat.
(Reference No. 019-16A)

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PHOTOGRAPH 5.:

APPENDIX D-1

TO

A HUMAN HEALTH RISK ASSESSMENT FOR POTENTIAL EXPOSURE TO POLYCHLORINATED BIPHENYLS (PCBs) FROM SUNKEN VESSELS USED AS ARTIFICIAL REEFS (FOOD-CHAIN SCENARIO)

March 2004

DATA VALIDATION REPORT

TABLE OF CONTENTS

1.0 INTRODUCTION

With two exceptions, this data validation report is identical to the Data Validation Report for Polychlorinated Biphenyl Analyses for Fish Tissue Samples collected for a Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls from Sunken Vessels Used as Artificial Reefs (Food Chain Scenario) dated February 2001. The data reporting forms included in the original report did not include all of the data qualifiers and qualifier codes assigned. However, it was verified that the electronic data provided to data users did include all of the assigned qualifiers and qualifier codes. As such, the conclusions drawn in the risk assessment are not affected by the error in the original data validation report. This revised version includes the updated sample reporting forms. In addition, the title to Section 4.0 was corrected.

Inactive U.S. Navy vessels would make excellent artificial reefs in U.S. Coastal waters if preliminary data collected by the South Carolina Department of Natural Resources (SCDNR) and the Space and Naval Warfare Systems Center (SPAWAR), suggesting that they do not pose a threat to human health or the environment from polychlorinated biphenyl (PCB) contamination, can be confirmed. Such a study has been initiated by the Navy because it is known and documented that PCBs accumulate in fish tissue. For this study, two species of finfish samples were collected from a reference reef and a target reef. The samples were filleted and the fillets were sent to Axys Analytical Services, Ltd. in Sidney, British Columbia for analysis of PCBs in accordance with EPA Method 1668, Revision A. A copy of this method is included as Appendix A to this Appendix D-1.

Method 1668, Revision A utilizes a high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS) analytical technique which allows for congener-specific determination of more than 150 PCBs, including those that are considered to be dioxin-like and environmentally relevant. The dioxin-like PCBs and the beginning and ending level-of-chlorination PCBs are determined by the isotope dilution technique of quantitation whereas the other PCBs are determined by the internal standard method of quantitation. This method also allows estimation of homolog totals by level of chlorination (LOC) and estimation of total PCBs in a sample by summation of the concentrations of the PCB homolog group totals. For this study, 13 dioxin-like PCB congeners and 26 environmentally relevant PCB congeners (including 8 congeners that are also dioxin-like) were individually quantitated along with the total PCB concentration for each homolog group and the total PCB concentration.

The analytical results for the fish tissue samples were reported in one data package with Axys identification number 4025. The samples were prepared and analyzed in four preparation batches. This report describes the results of the data validation conducted on this data set. The data validation process is summarized in Section 2.0. Section 3.0 presents the data validation results. This report is concluded with an overall assessment of the data with respect to the data quality indicators of reporting limits, accuracy, precision, completeness, representativeness, and

comparability in Section 4.0. The sample reporting forms, printed from the database, are included in Appendix B.

2.0 DATA VALIDATION PROCESS

Per the Sampling and Analysis Quality Assurance Project Plan (SAQAPjP), all fish tissue sample data received an independent data validation to evaluate the quality of the data generated by the laboratory and the effect of having quality control indicators outside evaluation limits on the usability of the data. The data validation was conducted in accordance with the provisions of the SAQAPjP which specifies using guidance from the SAQAPjP, the written method, EPA Region 10 guidance on the validation of Method 1668 data for the HRGC/HRMS analysis, and guidance from Functional Guidelines (EPA 1999), as appropriate for the method. In accordance with the SAQAPjP, the validation consisted of evaluating laboratory performance parameters for at least 25% of the data set and sample-specific parameters for 100% of the data set.

Laboratory performance parameters are defined as those parameters that are in control of the analytical laboratory and thusly, are indicators of the overall performance of analytical system. The laboratory performance parameters evaluated include:

- GC/MS performance checks (i.e. tuning and resolution);
- initial calibration;
- calibration verification;
- system performance (i.e. ongoing precision and recovery as indicated through the analysis of laboratory control samples and certified reference materials);
- compound identification;
- compound quantitation; and
- verification (i.e. checking for transcription errors).

Sample-specific parameters are those parameters that are influenced by sample handling procedures and the matrix of the individual sample. The sample-specific parameters evaluated include:

- case narrative comments;
- sample handling (i.e. COC procedures, sample receipt, and holding times);
- method blank results;
- rinsate blank results;
- internal standard recovery;
- matrix spike analysis,
- laboratory duplicate sample analysis;
- field duplicate agreement.

Following the evaluation of laboratory performance criteria and sample-specific criteria, an overall assessment of the data with respect to the data quality indicators of reporting limits, accuracy, precision, completeness, representativeness, and comparability was formulated. The overall assessment is presented in Section 4.0.

During the data validation process, the data reviewer annotated on the analytical data sheets data validation qualifiers ("U", "J", "UJ", and "R") and associated qualifier and bias codes as listed in Table 2-1. The purpose of the qualifier codes is to provide information with regard to the data quality condition(s) that resulted in the assigned qualifiers. The bias code provides an indication of the bias direction of the results qualified as estimated based on data quality condition(s) that resulted in the data qualification and the results of the other associated quality control analyses. The data qualifier codes are followed by a hyphen and the applicable bias code. For example, a result qualified as estimated due to a holding time exceedance, which resulted in a potential low bias in the result, has the following code annotated on the data sheet, "HT-L". In the case of multiple data quality conditions resulting in qualification, each qualifier code is listed and separated by a comma. For example, a result qualified as estimated due to low matrix spike recovery and poor method duplicate precision would have the following codes annotated on the data sheet, "MS, MD – I". The analytical results with assigned data qualifiers, qualifier codes, and bias codes are included in Appendix B.

Table 2-1
DATA VALIDATION QUALIFIER CODES AND BIAS DIRECTION CODES

Qualifier Code	Data Quality Condition Resulting In Assigned Qualification
general use	
HT	Holding time requirement was not met
T	Temperature requirement not met
P	Preservation requirements not met
HS	Sample received with headspace
MB or PB	Method blank or preparation blank contamination
LCS	Laboratory control sample evaluation criteria not met
FB	Field blank contamination
RB	Rinsate blank contamination
FD	Field duplicate evaluation criteria not met
RL	Reporting Limit exceeds decision criterion (for nondetects)
organic methods	
R	Resolution criteria not met
TUNE	Instrument performance (tuning) criteria not met
ICAL	Initial calibration evaluation criteria not met
CCAL	Continuing calibration evaluation criteria not met
ID	Target compound identification criteria not met due to ion ratio (IR) or no confirmation (NC)
SUR	Surrogate recovery outside acceptance range
MS	Matrix spike accuracy criteria not met
MD	Method duplicate precision criteria not met
EMPC(C)	Estimated maximum possible concentration due to co-elution with one or more congeners
IS	Internal standard evaluation criteria not met
Bias Codes	**Bias Direction**
H	Bias in sample result likely to be high
L	Bias in sample result likely to be low
I	Bias in sample result is indeterminate

3.0 DATA REVIEW NARRATIVE

The results for the fish tissue samples were reported in Axys data package 4025. The results of the evaluation of laboratory performance criteria are presented in Section 3.1. The results of the evaluation of sample-specific criteria are presented in Section 3.2.

The Table 3-1 lists the sample ID numbers, corresponding laboratory ID numbers, as well as fish type, reef type, and fillet date. For instances in which there are multiple laboratory IDs for the corresponding sample ID, results for the fish sample were reported from more than one analysis of the extract (e.g. multiple dilutions).

Table 3-1
SAMPLE IDENTIFICATION NUMBER CROSS REFERENCE

SAMP_ID	LAB_ID	FISH	REEF	SAMP_DATE
FS-01-VS-R	L2767-1	Vermilion Snapper	Reference	01-Aug-00
FS-02-VS-R	L2767-2	Vermilion Snapper	Reference	01-Aug-00
FS-05-VS-R	L2767-3	Vermilion Snapper	Reference	01-Aug-00
FS-05-VS-R	L2767-3R	Vermilion Snapper	Reference	01-Aug-00
FS-07-VS-R	L2767-4	Vermilion Snapper	Reference	01-Aug-00
FS-09-VS-R	L2767-5	Vermilion Snapper	Reference	01-Aug-00
FS-10-VS-R	L2767-6	Vermilion Snapper	Reference	01-Aug-00
FS-11-VS-R	L2767-7	Vermilion Snapper	Reference	01-Aug-00
FS-13-VS-R	L2767-8	Vermilion Snapper	Reference	01-Aug-00
FS-14-VS-R	L2767-9	Vermilion Snapper	Reference	01-Aug-00
FS-15-VS-R	L2767-10	Vermilion Snapper	Reference	01-Aug-00
FS-16-VS-R	L2767-11	Vermilion Snapper	Reference	01-Aug-00
FS-17-VS-R	L2767-12	Vermilion Snapper	Reference	01-Aug-00
FS-18-VS-R	L2767-13	Vermilion Snapper	Reference	01-Aug-00
FS-21-VS-R	L2767-14	Vermilion Snapper	Reference	01-Aug-00
FS-22-VS-R	L2767-15	Vermilion Snapper	Reference	01-Aug-00
FS-01-VS-T	L2767-16	Vermilion Snapper	Target	01-Aug-00
FS-02-VS-T	L2767-17	Vermilion Snapper	Target	01-Aug-00
FS-03-VS-T	L2767-18	Vermilion Snapper	Target	01-Aug-00
FS-04-VS-T	L2767-19	Vermilion Snapper	Target	01-Aug-00
FS-06-VS-T	L2767-20	Vermilion Snapper	Target	01-Aug-00
FS-07-VS-T	L2767-21	Vermilion Snapper	Target	01-Aug-00
FS-09-VS-T	L2767-22	Vermilion Snapper	Target	01-Aug-00
FS-11-VS-T	L2767-23	Vermilion Snapper	Target	01-Aug-00
FS-12-VS-T	L2767-24	Vermilion Snapper	Target	01-Aug-00
FS-12-VS-T	L2767-24 i	Vermilion Snapper	Target	01-Aug-00
FS-13-VS-T	L2767-25	Vermilion Snapper	Target	01-Aug-00
FS-15-VS-T	L2767-26 (A)	Vermilion Snapper	Target	01-Aug-00
FS-16-VS-T	L2767-27	Vermilion Snapper	Target	01-Aug-00

Table 3-1
SAMPLE IDENTIFICATION NUMBER CROSS REFERENCE

SAMP_ID	LAB_ID	FISH	REEF	SAMP_DATE
FS-17-VS-T	L2767-28	Vermilion Snapper	Target	01-Aug-00
FS-18-VS-T	L2767-29	Vermilion Snapper	Target	01-Aug-00
FS-20-VS-T	L2767-30	Vermilion Snapper	Target	01-Aug-00
FS-01-WG-R	L2767-31	White Grunt	Reference	02-Aug-00
FS-02-WG-R	L2767-32	White Grunt	Reference	02-Aug-00
FS-03-WG-R	L2767-33	White Grunt	Reference	02-Aug-00
FS-06-WG-R	L2767-34	White Grunt	Reference	02-Aug-00
FS-08-WG-R	L2767-35	White Grunt	Reference	02-Aug-00
FS-09-WG-R	L2767-36	White Grunt	Reference	02-Aug-00
FS-10-WG-R	L2767-37	White Grunt	Reference	02-Aug-00
FS-12-WG-R	L2767-38	White Grunt	Reference	02-Aug-00
FS-13-WG-R	L2767-39 (A)	White Grunt	Reference	02-Aug-00
FS-14-WG-R	L2767-40	White Grunt	Reference	02-Aug-00
FS-16-WG-R	L2767-41	White Grunt	Reference	02-Aug-00
FS-17-WG-R	L2767-42	White Grunt	Reference	02-Aug-00
FS-18-WG-R	L2767-43	White Grunt	Reference	02-Aug-00
FS-19-WG-R	L2767-44	White Grunt	Reference	02-Aug-00
FS-20-WG-R	L2767-45	White Grunt	Reference	02-Aug-00
FS-01-WG-T	L2767-46	White Grunt	Target	02-Aug-00
FS-01-WG-T	L2767-46 i	White Grunt	Target	02-Aug-00
FS-01-WG-T	L2767-46 Wi	White Grunt	Target	02-Aug-00
FS-02-WG-T	L2767-47	White Grunt	Target	02-Aug-00
FS-02-WG-T	L2767-47 N	White Grunt	Target	02-Aug-00
FS-02-WG-T	L2767-47 Ni	White Grunt	Target	02-Aug-00
FS-02-WG-T	L2767-47 W	White Grunt	Target	02-Aug-00
FS-03-WG-T	L2767-48	White Grunt	Target	02-Aug-00
FS-03-WG-T	L2767-48 i	White Grunt	Target	02-Aug-00
FS-03-WG-T	L2767-48 i2	White Grunt	Target	02-Aug-00
FS-04-WG-T	L2767-49	White Grunt	Target	02-Aug-00
FS-04-WG-T	L2767-49 i	White Grunt	Target	02-Aug-00
FS-04-WG-T	L2767-49 Wi	White Grunt	Target	02-Aug-00
FS-05-WG-T	L2767-50	White Grunt	Target	02-Aug-00
FS-07-WG-T	L2767-51	White Grunt	Target	02-Aug-00
FS-07-WG-T	L2767-51 i	White Grunt	Target	02-Aug-00
FS-08-WG-T	L2767-52	White Grunt	Target	02-Aug-00
FS-09-WG-T	L2767-53	White Grunt	Target	02-Aug-00
FS-09-WG-T	L2767-53 i	White Grunt	Target	02-Aug-00
FS-09-WG-T	L2767-53 Wi	White Grunt	Target	02-Aug-00
FS-10-WG-T	L2767-54	White Grunt	Target	02-Aug-00
FS-10-WG-T	L2767-54 i	White Grunt	Target	02-Aug-00
FS-10-WG-T	L2767-54 W	White Grunt	Target	02-Aug-00

Table 3-1
SAMPLE IDENTIFICATION NUMBER CROSS REFERENCE

SAMP_ID	LAB_ID	FISH	REEF	SAMP_DATE
FS-11-WG-T	L2767-55	White Grunt	Target	02-Aug-00
FS-11-WG-T	L2767-55 i2	White Grunt	Target	02-Aug-00
FS-14-WG-T	L2767-56	White Grunt	Target	02-Aug-00
FS-15-WG-T	L2767-57	White Grunt	Target	02-Aug-00
FS-15-WG-T	L2767-57 i	White Grunt	Target	02-Aug-00
FS-15-WG-T	L2767-57 W	White Grunt	Target	02-Aug-00
FS-16-WG-T	L2767-58	White Grunt	Target	02-Aug-00
FS-16-WG-T	L2767-58 i	White Grunt	Target	02-Aug-00
FS-16-WG-T	L2767-58 W	White Grunt	Target	02-Aug-00
FS-17-WG-T	L2767-59	White Grunt	Target	02-Aug-00
FS-17-WG-T	L2767-59 i	White Grunt	Target	02-Aug-00
FS-17-WG-T	L2767-59 W	White Grunt	Target	02-Aug-00
FS-18-WG-T	L2767-60	White Grunt	Target	02-Aug-00
FS-18-WG-T	L2767-60 N2	White Grunt	Target	02-Aug-00
FS-18-WG-T	L2767-60 Ni	White Grunt	Target	02-Aug-00
FS-18-WG-T	L2767-60 W	White Grunt	Target	02-Aug-00

3.1 Results of Laboratory Performance Criteria Evaluation

The results of the evaluation of laboratory performance criteria are described in this section. Evaluation of laboratory performance criteria allows the review to assess the performance of the entire analytical system independent of sample matrix effects.

3.1.1 GC/MS Performance Check (Tuning and Resolution)

The GC/MS instrument checks specified in Section 10.0 of Method 1668, Revision A are performed to ensure mass resolution, identification, and calibration. These criteria include the following.

- For the perfluorokerosene (PFK) molecular leak, the resolution must be greater than or equal to 10,000. The deviation between the exact mass and the theoretical mass for each of the three to five ions monitored must be less than 5 parts per million (ppm).
- Each lock mass monitored shall not deviate by more that 20% throughout its respective retention time window.
- The ion abundance ratios must be within the limits specified in Table 8 of the method.
- The GC/MS system must be able to meet the minimum detection levels specified in Table 2 of the method. In addition, for the low point calibration standard, the signal to noise ratio (S/N) must be greater than or equal to 10.0.
- The absolute retention time of PCB169 shall exceed 20.0 minutes of the SPM-octyl column and the retention time of PCB157 shall exceed 25.0 minutes on the DB-1 column.

- The compound pairs in the window defining mixture shall be determined.
- The isomer specificity requirements stated in Method 1668, Revision A (Section 6.9.1) shall be met. These specify that unique resolution, with a valley <40%, will be obtained for the following congeners pairs: PCB34 and PCB23, PCB187 and PCB182, and PCB156 and PCB157 (secondary column).

The GC/MS performance criteria stated above were satisfied for both columns and data qualification was not necessary.

3.1.2 Initial Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for PCBs. Initial calibration demonstrates that the instrument is capable of producing a linear calibration curve.

As required by the method, each initial calibration contained five standards. Each initial calibration was conducted within 30 days of the associated sample analyses. For the native analytes quantitated by the isotope dilution method, the %RSDs over the relative response factors (RRFs) for the five initial standards was <20%, with one exception. For the native analytes calculated by the internal standard method of quantitation, one %RSD was less than 35%. The absolute retention time of PCB209 was greater than 55 minutes on the SPB-Octyl column.

For the October 24, 2000 initial calibration, the %RSDs for one labeled congener was slightly greater than 20%. The %RSDs for PCB114L was 22.4%. Data qualification for the six associated samples was not considered to be necessary, however, because the deviation was slight. In addition, the method does not specify whether a criterion for the labeled internal standards. The associated samples are FS-01-VS-R, FS-02-VS-R, FS-07-VS-R, FS-10-VS-R, FS-11-VS-R, and FS-13-VS-R.

3.1.3 Calibration Verification

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument remains capable of producing acceptable qualitative and quantitative data each day that samples are analyzed.

For each calibration verification and ongoing precision and recovery (OPR) analysis, the following criteria were evaluated:

- Ion abundance ratios within acceptance ranges.
- S/N ratio >10:1.
- Adequate recovery of target analytes in calibration verification standard per requirements in Table 6 of the method.
- The absolute retention times of the labeled standards were within ±15 seconds of the preceding standard analysis.

- The relative retention times for native PCBs and labeled compounds in the verification test were within the required relative retention time (RRT) ranges.

Results for native and labeled PCB congeners in all calibration verification standard (SC3) analyses and in all Ongoing Precision and Recovery (OPR) analyses met the acceptance criteria specified in Section 15.3 of the method and data qualification was not required.

3.1.4 System Performance

System performance was evaluated by the results obtained for the routine analysis of a spiked control matrix (OPR analysis) and a certified reference material (CRM). Results for these analyses indicate whether the analytical system is in control. The subsections below describe the results for each evaluation parameter.

3.1.4.1 Ongoing Precision and Accuracy. As specified by the method, ongoing precision and recovery was monitored by preparing and analyzing a spiked control matrix sample with each preparation batch. The control matrix used was corn oil. These spiked samples are equivalent to laboratory control samples (LCS). The table below lists the OPR samples associated with each preparation batch.

OPR Sample	Fish Population
WG3464-102	Vermilion Snapper – Reference Reef
WG3475-102	Vermilion Snapper – Target Reef
WG3495-102	White Grunt – Reference Reef
WG3513-102	White Grunt – Target Reef

The recoveries were compared to the acceptance ranges in Table 6 of Method 1668, Revision A (50-150% for natives, 30-140% for labeled standards, and 40-125% for clean-up standards). All recoveries were within the applicable acceptance range and data qualification was not necessary.

3.1.4.2 Analysis of Certified Reference Material (CRM). As indicated by the table below, an aliquot of a CRM was prepared with each preparation batch. The CRM provided was labeled as NIST CRM 1974a (organics in mussel tissue).

CRM Sample	Fish Population
WG3464-103	Vermilion Snapper – Reference Reef
WG3475-103	Vermilion Snapper – Target Reef
WG3495-103	White Grunt – Reference Reef
WG3513-103	White Grunt – Target Reef

The results are summarized in the Table 3-2.

Table 3-2
SUMMARY OF RESULTS VS. CERTIFIED VALUES

PCB	Certified Value	Concentration found (pg/g)				Mean/Average Recovery	RSD (%)	Co-eluting Congeners
		WG3464	WG3475	WG3495	WG3513			
44	8280±840	**11000**	**13700**	**15700**	**16100**	14100 / **170%**	16.5	47/65
49	10120±590	**6470**	**7810**	**9210**	9650	8290 / 82%	17.4	69
52	13100±1300	**9160**	**10900**	13000	13700	11700 / 89%	17.7	
66	11540±500	**8640**	11400	12000	**13100**	11300 / 98%	16.8	
101	14600±1100	**11700**	13500	**15900**	**15900**	14300 / 98%	14.3	90/113
105	6040±390	**4630**	**4910**	6310	5690	5390 / 89%	14.2	
118	14900±400	**11500**	**12600**	**15600**	**14200**	13500 / 91%	13.3	
128	2500±390	**1530**	**1760**	**2090**	**2020**	1850 / 74%	13.9	166
138	15200±1100[1]	**11100**	**13800**	15900	16100	14200 / 93%	16.4	129/160/163
156	850±110	**691**	**700**	892	881	791 / 93%	14.0	157
170	630±120	**128**	**148**	**195**	**180**	163 / **26%**	18.6	
180	1950±430	**912**	**1030**	**1290**	**1300**	1130 / 58%	17.1	193
183	1820±270	**1310**	**1540**	1900	1840	1650 / 91%	16.7	185
187	3870±270	**2020**	**2350**	**2660**	**2840**	2470 / 64%	14.6	

[1] Certified value for combination of PCB 138/163/164.
Table is limited to those PCB congeners that are project target analytes.

While many results shown in Table 3-2 are not within the 95% level of confidence window of the certified value, most mean values (12/14) are within the acceptance range of 50-150%, which is the acceptance range specified in the method for evaluating OPR samples. The two exceptions are PCB44 and PCB170. For PCB44 and PCB170, the determined values are consistently higher and lower, respectively, than the certified values. Therefore, data qualification was limited to PCB44 and PCB170. PCB44 and PCB170 were reported as present in all samples. Thus, the results for PCB44 were qualified as estimated (J) with a potential high bias and the results for PCB170 were qualified as estimated (J) with a potential low bias. The high recovery of PCB44 is likely related to the fact that this congener coelutes with PCB47 and PCB65. Overall, the CRM results are considered to indicate that the accuracy of the analyses, and thus the performance of the analytical system, is acceptable. This is further demonstrated by the results in Table 3-3 which presents the ratio of individual results to the mean of the four results for each congener.

Table 3-3
RATIO OF INDIVIDUAL CONCENTRATIONS TO MEAN CONCENTRATION

PCB Congener	Ratio			
	WG3464	WG3475	WG3495	WG3513
44	0.779	0.970	1.11	1.14
49	0.781	0.943	1.11	1.16
52	0.784	0.932	1.11	1.17
66	0.766	1.01	1.06	1.16
95	0.832	0.945	1.16	1.07
99	0.813	0.959	1.12	1.10
101	0.821	0.947	1.12	1.12
105	0.860	0.912	1.17	1.06
110	0.841	0.975	1.17	1.02
118	0.853	0.935	1.16	1.05
128	0.827	0.951	1.13	1.09
138	0.780	0.970	1.12	1.13
149	0.743	0.990	1.12	1.14
151	0.739	0.889	1.20	1.17
153	0.776	0.927	1.15	1.15
156	0.874	0.885	1.13	1.11
170	0.786	0.909	1.20	1.11
180	0.805	0.909	1.14	1.15
183	0.795	0.935	1.15	1.12
187	0.819	0.952	1.08	1.15
Mean Ratio	0.804	0.942	1.14	1.12
RSD (%)	4.64	3.42	3.06	3.90

The uniformity of the ratio within each analysis shown in Table 3-3 indicates that the differences between replicate SRM results are most likely due to sampling variability rather than imprecision in analysis. This would be consistent with the high water content of the samples, the relatively small sample size dictated by the PCB concentrations present, and sub-sampling difficulties encountered.

The sample, prepared by NIST as a frozen homogenate, had thawed upon receipt at Axys and was no longer in the powder-like form required for the solid sub-sampling technique recommended in the NIST Certificate of Analysis. For analysis at Axys, thawing and manual re-homogenization were required prior to sub-sampling and additional analytical uncertainty could be expected as the result of this.

3.1.5 Compound Identification

The following identification criteria had to be met for a PCB congener to be reported as present:

- The signals for the two exact m/z's listed in Table 7 must be present and must maximize within ±2 seconds of one another.
- The signal to noise ratio (S/N) of each of the two exact m/z's must be greater than or equal to 2.5 for a sample and greater than or equal to 10 for a calibration standard.

- The ratio of the integrated ion currents for the selected ion current profiles (SICPs) for both the exact m/z's monitored must be within the limits specified in Table 8 of the method.
- The relative retention time (RRT) of the peaks representing the unlabeled PCB congeners must be within 5% of the RRT obtained in the preceding standard analyses.
- The results for PCB156 and PCB157, which co-elute on the primary SPB-Octyl column, must be confirmed on a secondary column (DB-1).

With few exceptions, modifications to target compound identifications were not necessary. As a conservative measure, some target analytes were reported as detected although the ion ratio criterion was not satisfied. These results received a "R" flag from the laboratory. In most cases (24/26), the reported concentration was below the minimum reporting limit (MRL). Results for these analytes were qualified as nondetect (U) due to failure to meet the applicable ion ratio criterion. A qualifer code of ID(IR)-I was assigned to these results. For these results, the reported concentration is considered to be the "effective" reporting limit. The table below lists the affected samples.

Field Sample	Analyte	Field Sample	Analyte
FS-20-WG-R	PCB18 PCB77 PCB114 PCB184	FS-17-WG-R	PCB123 PCB126 PCB184 PCB189
FS-19-WG-R	PCB49	FS-06-WG-R	PCB18
FS-07-VS-R	PCB114 PCB184	FS-09-WG-R	PCB123 PCB184
FS-13-WG-R	PCB77 PCB184	FS-14-WG-R	PCB123 PCB126
FS-02-WG-R	PCB126	PS-08-WG-R	PCB77
FS-14-WG-T	PCB184	FS-11-WG-T	PCB77
FS-10-WG-R	PCB126	FS-18-WG-R	PCB77 PCB157 PCB184

Also, PCB169 was reported as present for five samples even though the second column failed to confirm its presence. As such, the PCB169 results for samples FS-10-VS-R, FS-01-WG-R, FS-02-WG-R, FS-03-WG-R, and FS-20-WG-R were qualified as nondetect (U) at the detection limit calculated from the primary column. A qualifier code of ID(NC)-I was assigned to these results to indicate that the identification was not confirmed and the bias direction is indeterminate.

PCB156 and PCB157 were confirmed on the secondary column. Because these two PCBs do not co-elute on the DB-1 column, all results for PCB156 and 157 were reported from the DB-1 column. In addition, all PCB169 results were confirmed by the secondary column.

3.1.6 Compound Quantitation

Target compound quantitation was evaluated by recalculating reported results to verify that calculations were performed using the proper values for all factors in the calculation. These

factors include target analyte areas, reference internal standard area, internal standard concentration, sample weight, and relative response factor (RRF).

No errors in compound quantitation were found. However, several target PCB congeners co-elute with one or more non-target PCBs. Detected results or these PCBs were qualified as estimated (J) with a potential high bias because the reported value represents the sum of the concentrations of the target PCB in addition to other co-eluting congeners. A qualifier code of EMPC(C)-H was assigned to these results, where EMPC stands for estimated maximum possible concentration and the "C" in parentheses indicates co-elution as the cause. The affected PCBs are: PCB18, PCB28, PCB44, PCB49, PCB87, PCB101, PCB128, PCB138, PCB153, PCB180 and PCB183. Of these, the only dioxin-like congener is PCB180 which co-elutes with only one non-target PCB congener (PCB193). As such, risk calculations for the dioxin-like congeners should not be significantly affected by the potential high bias in PCB concentrations due to coelution.

The reviewer noted that PCB126 detection limits for some samples were several times greater than detection limits for other samples without a noticeable difference in the chromatragraphic response in the applicable region of the chromatogram. PCB126 is a dioxin-like congener. Because one-half of the detection limit is used in risk calculations for nondetect results, these apparently higher detection limits were of concern because they could potentially artificially raise risk calculations. Thus, Axys was contacted regarding the atypical PCB126 detection limits.

Axys explained that the detection limits are calculated by the instrument using a factor of 3 above the average noise detected in the region of the target analyte. Axys agreed that some of the PCB126 detection limits appeared to be unusually high. Thus, Axys reviewed all PCB126 detection limits and manually calculated detection limits. Based on the additional review, PCB126 detection limits for seven samples were revised. Revised sample reporting forms were sent for the affected samples. The electronic data were corrected by hand. The affected samples include: FS-11-VS-T, FS-09-WG-T, FS-10-WG-T, FS-15-WG-T, FS-16-WG-T, FS-17-WG-T, and FS-18-WG-T. In all seven cases, the manually calculated revised detection limit was less than the detection limit reported initially.

3.1.7 Verification

The reviewer checked for correspondence between the raw sample data and the summary data provided. With the exception of the PCB 169 results for five samples detailed above in Section 3.1.5, no transcription or reporting errors were found.

3.2 Results of Sample-Specific Review Criteria

The results of the evaluation of sample-specific criteria are described in this section. Evaluation of sample-specific criteria allows the reviewer to assess the how the individual sample matrices affect the method. In addition, the results obtained from field quality control samples are evaluated and related to the investigative field samples.

3.2.1 General Overall Assessment

All results are considered to be usable for meeting project objectives as qualified. Some results were qualified as nondetect based on method blank results, rinsate blank results, ion ratios, or lack of confirmation. Some results were qualified as estimated due to matrix spike recoveries, CRM recoveries (as discussed above in Section 3.1.4.2), or due to co-elution with non-target congeners (as discussed above in Section 3.1.6)

3.2.2 Case Narrative Comments

The case narrative was very thorough, covering sample receipt and storage, sample preparation, analysis, reporting conventions, and QA/QC issues, including a summary and discussion of the CRM results.

- The case narrative noted that the samples had started to thaw upon analysis.
- The tissue samples were homogenized and a representative subsample (approximately 15 grams) was taken for analysis.
- The samples were analyzed in four batches, each containing a method blank, a laboratory generated spiked sample (LCS), a laboratory duplicate, a matrix spike sample (MS), and a client-supplied certified reference material (CRM).
- Chromatographic separation of PCB congeners was carried out on an SPB-Octyl chromatography column. Because PCB 156 and PCB 157 co-elute on this column, a second column (DB-1) was used for resolution of these congeners.
- The case narrative provided an explanation of the Axys reporting conventions, including definitions of all laboratory qualifiers.
- The case narrative noted that all QC (linearities, calibration verifications, ongoing precision and recovery, blanks) were met in the analysis of these samples.
- The PCB 169 results were also reported from the confirmation DB-1 column due to potential interferences from higher homologue congeners in the quantification of this analyte on the Octyl column.
- The PCB 118 results for samples FS-02-WG-T and FS-18-WG-T were reported from the confirmation DB-1 column because the recovery of the PCB 118 labeled internal standard, while being within limits, was notably higher than the other labeled standards on the Octyl column. (The cause is thought to be an interference which boosts the response of the labeled compound which could potentially lead to authentic PCB 118 being under-reported.)
- Matrix spike results for some analytes were not reported for the matrix spike conducted on sample FS-02-WG-T because the native concentrations of the spiked congeners were greater than four times the spiking level rendering the spike results inappropriate for assessing accuracy.

3.2.3 Sample Handling (COC Procedures, Sample Receipt, and Holding Times)

The fish samples were filleted on August 1 and 2, 2000. After filleting, the samples were wrapped in foil and frozen. The fish fillet samples and four rinsate blanks were shipped by Federal Express to Axys on September 13, 2000 under proper COC procedures. Custody seals were used and the shipping containers were intact upon receipt at Axys on September 15, 2000. Cooler temperatures upon receipt were 1°C to 3°C. Sample receiving notes indicated that the samples were received in good condition with ice present. The fish fillet samples were described as semi-thawed. The samples were stored in the dark at <10°C until homogenization.

Sample homogenization occurred between September 19, 2000 and October 27, 2000. Sample extraction occurred between October 13 and October 26, 2000. Sample analysis occurred between October 24, 2000 and November 11, 2000. Method 1668, Revision A does not specify holding time requirements, but does state that if stored in the dark at <10°C, tissue samples can be stored for up to one year. The SAQAPjP specifies a holding time limit of 1 year. Thus, data qualification on the basis of sample preservation, COC procedures, or holding times was not necessary.

However, one difference in sample preparation was noted. The method specifies in Section 12.4 that prior to extraction, the tissue samples (typically a 10g aliquot) should be dried with 30 to 40g of anhydrous sodium sulfate for 12-24 hours. The fish tissue samples were dried for ½ to 1 hour. However, Axys indicated that the drying time was sufficient to reach equilibrium as the amount of anhydrous sodium sulfate used ranged from 75-100g and the sample volume was approximately 15g. The laboratory modified the drying step in order to process samples more efficiently. They indicated that studies of the modified process showed that the ½ to 1 hour elapsed time was sufficient to dry the solvent. The objective of drying the solvent is to assure uniform and adequate extraction efficiency of the solvent. It is not used in percent moisture determination. The standard recoveries measured on samples verify that extraction efficiency has not been adversely affected. The shortened drying time is not considered to affect the overall quality or usability of the data.

3.2.4 Blank Results

Analyte results for samples were qualified as nondetect (U) if they were less than five times the amount found in the associated method blank or rinsate blank. The subsections below detail which sample results were qualified as nondetect on the basis of method blank or rinsate blank results. In these instances, the measured concentration becomes the effective sample reporting limit.

3.2.4.1 Method Blanks. The samples were prepared in four batches. As such, there were four method blanks (MBs) analyzed in association with the fish tissue samples. The table below summarizes the method blank detections and associated fish population contained in each of the four batches.

Analyte	WG3464-101 (VS-R[1])	WG3475-101 (VS-T)	WG3494-101 (WG-R)	WG3513-101 (WG-T[2])
PCB 8		0.416 R	0.386	0.570 R
PCB 18	0.205	0.312	0.259	0.294
PCB 44	0.207 R	0.305	0.685 R	1.36
PCB 49		0.149	0.100	0.239 R
PCB 52	0.153 R	0.261	0.178	0.366
PCB 66		0.123 R	0.105 R	0.208
PCB 77			0.048 R	
PCB 114			0.061 R	
PCB 118	0.129 R	0.199 R	0.351	1.36/1.03[3]
PCB 123		0.045 R	0.018R	
PCB 126			0.038 R	
PCB 128				0.176 R
PCB 153	0.558 R	0.205 R	1.03	1.52
PCB 156[4]	0.268	0.067		0.246
PCB 157[4]	0.171			0.124
PCB 167		0.031 R		0.144 R
PCB 170		0.039 R	0.365	0.274
PCB 180	0.635	0.110 R	1.05 R	0.891 R
PCB 187	0.144 R	0.057 R	0.312	0.505
PCB 189		0.021 R	0.046 R	
PCB 195			0.143 R	
PCB 209		0.047	0.151 R	0.095 R
t MCBs		0.159	0.599	
t DiCBs		0.631	0.969	
t TriCBs	0.205	0.832	0.818	0.707
t TeCBs		0.852	1.39	1.57
t PeCBs		0.469	0.811	3.45
t HxCBs		0.245	1.03	2.22
t HpCBs	0.635		0.677	0.880
t OCBs		0.037	2.42	0.277
t DeCBs (=209)		0.047	0.151 R	0.095 R
t PCBs	0.840	3.27	8.71	9.10

VS = Vermilion Snapper -R = Reference Reef
WG = White Grunt -T = Target Reef
All units are pg/g.
R qualifier denotes that the ratio criterion was not met. Such values were treated as detections because the same interferences noted in the MBs are likely to be present in the samples as well.
[1] Except for individual congeners for sample FS-05-VS-R.
[2] Including individual congeners for sample FS-05-VS-R.
[3] Result for confirmation column; two PCB118 results in this batch were reported from confirmation column.
[4] Results for confirmation column as all PCB156 and PCB157 results were reported from confirmation column.

The table below lists the sample results that were qualified as nondetect (U) based on the method blank results.

Sample	PCB 8	PCB 18	t MCBs	t DiCBs
FS-12-VS-T	U		U	
FS-20-VS-T			U	
FS-01-WG-R			U	
FS-02-WG-R	U	U	U	U
FS-03-WG-R			U	U
FS-06-WG-R	U	U	U	U
FS-08-WG-R	U	U	U	U
FS-09-WG-R	U	U	U	U
FS-10-WG-R	U	U	U	U
FS-12-WG-R	U	U	U	U
FS-13-WG-R	U	U		
FS-14-WG-R	U	U	U	U
FS-16-WG-R		U		U
FS-17-WG-R	U	U	U	U
FS-18-WG-R	U	U		U
FS-19-WG-R	U	U		U
FS-20-WG-R	U	U		U
FS-14-WG-T	U			

3.2.4.2 Rinsate Blanks. Four rinsate blanks were analyzed in association with these samples. Two rinsates, samples RS-03-080100 and RS-04-080100, were prepared by pouring "reagent-free" water over sampling equipment used for filleting the fish. Rinsate sample RS-03-080100 was associated with all samples filleted on August 1, 2000. These samples include all of the vermilion snapper samples. Rinsate sample RS-04-080100 was associated with all of the samples filleted on August 2, 2000 (Note: the collection date recorded on the COC for this sample is August 3, 2000). These samples include all of the white grunt samples.

The other two rinsates blanks (termed "proofs" by Axys), samples PROOF #2 VIRTIS and PROOF #11 G01, were prepared at the laboratory by pouring "reagent-free" water through the two decontaminated grinders used for sample homogenization. Rinsate blank sample PROOF #11 G01 was associated with all samples processed using the G01 grinder. Rinsate blank sample PROOF #2 VIRTIS was associated with all samples processed using the Virtis grinder. Forty-eight of the sixty samples were prepared using the G01 grinder.

The table below summarizes the rinsate blank detections that remained after accounting for method blank contamination of the associated aqueous method blanks.

Analyte	RS-03-080100	RS-04-080300	PROOF #11 G01	PROOF #2 VIRITIS
PCB 8			2.59	2.84
PCB 123	0.354			
PCB 170		0.364		
PCB 187			0.991	
PCB 189	0.202			
t MCBs				3.80
t DiCBs			6.33	11.4
t HpCBs		0.652		

All units are pg/l.

The rinsate blank concentrations (ug/l) were converted to equivalent fish tissue concentrations by assuming that all of the target analyte present in the rinsate blank aliquot analyzed was present in the fish tissue aliquot analyzed. The table below lists the sample results that were qualified as nondetect (U) based on the rinsate blank results.

Sample	PCB8	t MCBs	t DiCBs
FS-01-VS-R		U	
FS-02-VS-R		U	
FS-05-VS-R		U	
FS-10-VS-R		U	
FS-11-VS-R		U	
FS-13-VS-R		U	
FS-15-VS-R		U	
FS-16-VS-R		U	
FS-18-VS-R		U	
FS-22-VS-R		U	U
FS-11-VS-T		U	
TS-12-VS-T		U	
FS-20-VS-T		U	
FS-02-WG-R		U	
FS-03-WG-R		U	
FS-06-WG-R	U	U	U
FS-08-WG-R		U	U
FS-09-WG-R		U	U
FS-10-WG-R		U	U
FS-12-WG-R	U	U	U
FS-13-WG-R	U		
FS-14-WG-R	U	U	U
FS-16-WG-R			U
FS-17-WG-R	U		U
FS-18-WG-R	U		U
FS-19-WG-R			U
FS-20-WG-R			U
FS-05-WG-T		U	
FS-17-WG-T		U	

3.2.5 Standard Recovery

Standards are injected into the individual samples prior to extraction, prior to clean-up, and prior to injection to monitor the various stages of sample preparation and analysis. The results obtained for each type are discussed below.

3.2.5.1 Recovery of ^{13}C-Labeled Internal Standards. C^{13}-Labeled PCB congeners are added to each sample and method blank prior to extraction in order to be an internal standard for the quantitation of native dioxin-like and environmentally relevant PCB isomers. These internal standards also serve for the assessment of the extraction efficiency for the individual sample matrices. The recoveries of the ^{13}C-labeled internal standards were compared to the recovery limits of 25-125% specified in Table 6 of the Method 1668, Revision A.

For each sample, the recoveries of all project-related internal standards were within the acceptance range of 25-125% and data qualification was not necessary.

3.2.5.2 Recovery of Clean-up Standards. A solution containing three ^{13}C-labeled congeners is spiked into each sample and blank prior to clean-up to measure the efficiency of the clean-up process. The recoveries of the clean-up standards were compared to the acceptance range of 30-135% specified in Table 6 of Method 1668, Revision A.

For each sample, the recoveries of all three clean-up standards were within the acceptance range of 30-135% and data qualification was not necessary.

3.2.5.3 Recovery of ^{13}C-Labeled Injection Internal Standards (Recovery Standards). A solution containing five ^{13}C-labeled PCBs congeners is spiked into each sample prior to injection (but after clean-up) for the following reasons:

- to determine the recovery efficiency of the combined extraction and clean-up procedures,
- to determine if the GC/MS sensitivity and response are stable during every analytical run, and
- to determine if the same amount of extract was injected into the GC/MS.
- Injection internal standard performance was evaluated by comparing the total area for the two characteristic masses for each of the injection standards to a range of –25% to +200% of the average area sum for the five initial calibration standards.

The responses noted for the injection standards for each sample satisfied this evaluation criterion and data qualification was not necessary.

3.2.6 Matrix Spike Results

As indicated in the table below, a matrix spike sample was prepared on one sample from each batch (each representing one fish population).

Matrix Spike Sample	Parent Sample	Fish Population
WG3464-106	FS-09-VS-R	Vermilion Snapper – Reference Reef
WG3475-106	FS-09-VS-T	Vermilion Snapper – Target Reef
WG3495-106	FS-03-WG-R	White Grunt – Reference Reef
WG3513-106	FS-02-WG-T	White Grunt – Target Reef

The recoveries were compared against the SAQAPjP acceptance range of 50-150. With two exceptions, all recoveries were within the acceptance range. For the matrix spike analysis on sample FS-09-VS-T, the recoveries of PCB 105 and PCB 118 were 164% and 217%, respectively. As such, the PCB 105 and PCB 118 results for all vermilion snapper samples from the target reef were qualified as estimated (J) with a potential high bias.

It should be noted that for the matrix spike on sample FS-02-WG-T, eight of 12 spike recoveries were not considered to be applicable for assessing accuracy with respect to the sample matrix because the native sample concentrations were greater than 4x the spiking concentration.

3.2.7 Laboratory Duplicate Analysis Results

As indicated in the table below, a duplicate sample was prepared on one sample from each batch (each representing one fish population).

Duplicate Sample	Parent Sample	Fish Population
WG3464-105	FS-01-VS-R	Vermilion Snapper – Reference Reef
WG3475-105	FS-15-VS-T	Vermilion Snapper – Target Reef
WG3495-105	FS-13-WG-R	White Grunt – Reference Reef
WG3513-105	FS-17-WG-T	White Grunt – Target Reef

The SAQAPjP specified a precision objective of an RPD less than 50%. However, an RPD is not appropriate for assessing precision at concentrations near the reporting limit. The results were, therefore, compared against the following concentration-dependent acceptance criteria as acceptance limits for low concentration samples were not specified in the method, SAQAPjP, or Region IX SOP for the Validation of Method 1668 PCB Data.

- For analytes where either result was <5x the Minimum Reporting Limit (MRL), acceptable agreement was indicated if the absolute difference between the results was <2xMRL.

- For analytes where both results were >5xMRL, acceptable agreement was indicated if the relative percent difference (RPD) between the results was <50%.

The results for all laboratory duplicate samples satisfied the applicable evaluation criterion. As such, data qualification was not necessary. The laboratory duplicate results indicate that the overall analytical precision obtained was acceptable.

3.2.8 Field Duplicate Results

As indicated in the table below, one field duplicate sample was prepared for each sample population. The field duplicates were submitted as blind samples.

Primary Sample	Field Duplicate Sample	Fish Population
FS-22-VS-R	BLIND-01-091300	Vermilion Snapper – Reference Reef
FS-06-VS-T	BLIND-02-091300	Vermilion Snapper – Target Reef
FS-04-WG-T	BLIND-03-091300	White Grunt – Target Reef
FS-01-WG-R	BLIND-04-091300	White Grunt – Reference Reef

The field duplicate results were evaluated using the following concentration-dependent evaluation criteria, which are analogous to the criteria used to evaluate laboratory duplicate results.

- For analytes where either result was <5x the MRL, acceptable agreement was indicated if the absolute difference between the results was <3xMRL.

- For analytes where both results were >5xMRL, acceptable agreement was indicated if the relative percent difference between the results was <50%.

All field duplicate results satisfied the applicable evaluation criterion indicating that overall sampling and analysis precision can be considered acceptable. As such, the field duplicate results suggest that the fish tissue samples are representative of the medium sampled.

4.0 OVERALL ASSESSMENT OF POLYCHLORINATED BIPHENYL DATA

The fish tissue PCB results are considered to be usable for meeting project objectives with the qualifications noted in Section 3. Some results were qualified as nondetect (U) on the basis of method blank and/or rinsate blank contamination and some results were qualified as nondetect on the basis of identification criteria. In these instances, the reported value is then considered to be the "effective" reporting limit. In addition, a few sample results were qualified as estimated (J) on the basis of associated matrix spike recoveries, CRM results, or due to co-elution with one or more non-target PCBs.

The quantitative data quality indicators of sensitivity, accuracy, and precision are addressed below.

4.1 Sensitivity

For Method 1668, Revision A, analyte reporting limits are analyte-specific and sample-specific. For all target analytes, the laboratory calculated an estimated detection limit (EDL) based on a signal to noise ratio of 3:1, in accordance with the method requirements.

In accordance with Section 3.2.4 of the SAQAPjP, an average target reporting limit less than 0.015 ng/g (15 pg/g) per individual congener was necessary in order to have a total PCB reporting limit of 3.2 ng/g which is necessary for risk-based evaluations. Of the 149 nondetect results for individual congeners (for which the average detection limit was 4 pg/g and the median detection limit was 0.26 pg/g), only 12 had detection limits greater than 15 pg/g. Of these, eight results were for PCB126 and four were PCB169 results and all occurred for samples from the white grunt target population. However, in each instance, the detection limits for the nondetect results PCB126 of PCB169 results only accounted for 0.02% of the total PCB result. As such, the level of sensitivity achieved for the individual sample analyses is considered to be acceptable.

4.2 Accuracy

Accuracy is defined as the degree of agreement to an accepted reference or true value. Accuracy was measured as the percent recovery (%R) of an analyte in a reference standard (LCS or CRM) or spiked sample (MS).

All LCS recoveries were within acceptance limits. The mean recoveries for 12 of 14 CRM target analytes were within acceptance range of 50-150%. Forty-three of the 45 applicable matrix spike recoveries were within acceptance ranges. Since the vast majority of spike recoveries were within acceptance ranges, the overall level of accuracy achieved for the analyses is considered to be acceptable.

4.3 Precision

Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true values (i.e. reproducibility). Precision of laboratory measurements was evaluated by the comparison of sample/sample duplicate results.

The overall analytical precision of the analyses is considered to be acceptable as all laboratory duplicate measurements satisfied the applicable evaluation criterion.

4.4 Completeness

Completeness is defined as the percentage of data that is considered to be valid for meeting project objectives. Valid results include those qualified as estimated or nondetect.

All analytical results are considered to be valid and usable for meeting project objectives. As such, the analytical completeness for this data set is 100%.

4.5 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The DQO process was used in the development of the associated workplan, thereby optimizing the sample design. Representativeness was maintained during the sampling effort by completing sampling in compliance with the workplan and relevant SOPs.

Consistent, uniform sample handling protocols, including such tasks as storage, preservation, transportation, were used to assure that the representativeness of the samples gathered met project objectives. Proper documentation in the field and laboratory verified that protocols were followed and that sample identification as well as integrity was preserved.

In addition, one field duplicate sample was prepared for each sample population (i.e. white grunt target, white grunt reference, vermilion snapper target, vermilion snapper reference). All field duplicate results satisfied the applicable evaluation criterion indicating that overall sampling and analysis precision can be considered acceptable. As such, the field duplicate results suggest that the fish tissue samples are representative of the medium sampled.

4.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision because these quantities are measures of data reliability. Data are comparable if collection techniques, measurement procedures, analytical methods, and reporting limits are equivalent for the samples within a set. As the samples within this set were analyzed in accordance with the quality assurance and quality control measures prescribed by the analytical method and the SAQAPjP, and acceptable levels of overall accuracy and precision were obtained, the data within this set are considered to be comparable to each other.

4.7 General Observations

Careful examination of all laboratory documentation and raw data was conducted and no errors were found in sample preparation or analysis.

While the sample populations (VS-R, VS-T, WG-R, WG-T) were generally homogenized/ prepared and analyzed together as a set, there were some instances where a sample of a particular population got mixed with a difference population during preparation and/or analysis. For instance, sample FS-05-VS-R was re-prepared and analyzed with the WG-T samples. Also, the WG-T and WG-R field duplicate samples were homogenized/prepared and analyzed with the opposite sample population. Despite these transpositions in preparation/analysis batches, results for the individual samples still tended to agree extremely well with their own population. In addition, a variety of Axys personnel were involved in the preparation of each batch. These results strongly suggest that no systematic errors were made in sample preparation and analysis.

APPENDIX A

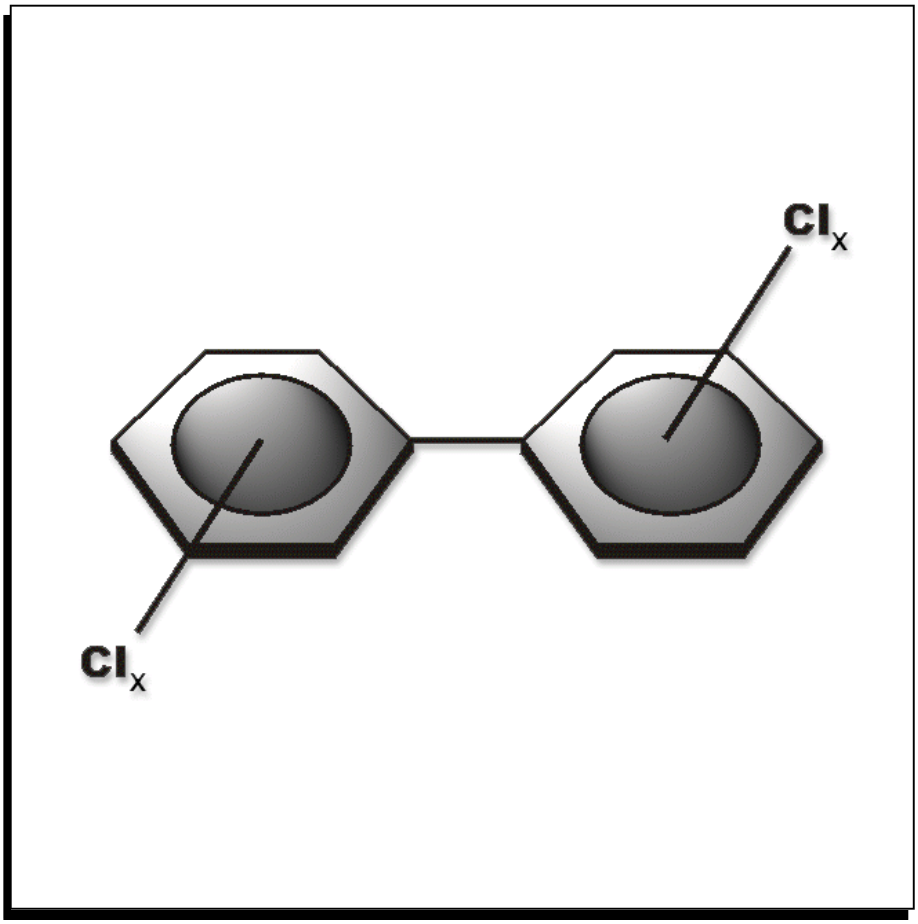
METHOD 1668A

United States
Environmental Protection
Agency

Office of Water
(4303)

EPA No. EPA-821-R-00-002
December 1999

Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS



Acknowledgments

EPA Method 1668, Revision A (Method 1668A; the Method) was prepared under the direction of William A. Telliard of the Engineering and Analysis Division within EPA's Office of Water. Additional assistance in preparing the method was provided by DynCorp Information and Enterprise Technology and Interface, Inc.

Disclaimer

Method 1668A has been reviewed and approved for publication by the Engineering and Analysis Division of the U.S. Environmental Protection Agency. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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Introduction

Method 1668 was developed by the U.S. Environmental Protection Agency's (EPA's) Office of Science and Technology for congener-specific determination of the polychlorinated biphenyl (PCB) congeners designated as toxic by the World Health Organization. Revision A of Method 1668 has been expanded to include congener-specific determination of more than 150 chlorinated biphenyl (CB) congeners. The toxic PCBs and the beginning and ending level-of-chlorination CBs are determined by isotope dilution high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The remaining CBs are determined by internal standard HRGC/HRMS. Method 1668A is applicable to aqueous, solid, tissue, and multi-phase matrices.

Method 1668A is based on validation in a single laboratory. The basic revision of Method 1668 was validated in two laboratories.

Questions concerning this method or its application should be addressed to:

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Note: This method is performance based. The laboratory is permitted to omit any step or modify any procedure provided that all performance requirements in this method are met. The laboratory may not omit any quality control analyses. The terms "shall," "must," and “may not” define procedures required for producing reliable results. The terms "should" and "may" indicate optional steps that may be modified or omitted if the laboratory can demonstrate that the modified method produces results equivalent or superior to results produced by this method.

Method 1668, Revision A

Chlorinated biphenyl congeners in water, soil, sediment, biosolids and tissue by HRGC/HRMS

1.0 Scope and application

1.1 Method 1668, Revision A (Method 1668A; the Method) is for determination of chlorinated biphenyl congeners (CBs) in water, soil, sediment, biosolids, tissue, and other sample matrices by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS).

1.1.1 The CBs that can be determined by this Method are the 12 polychlorinated biphenyls (PCBs) designated as toxic by the World Health Organization (WHO) plus the remaining 197 CBs, approximately 125 of which are resolved adequately on an SPB-octyl gas chromatographic column to be determined as individual congeners. The remaining approximately 70 congeners are determined as mixtures of isomers (co-elutions).

1.1.2 The 12 PCBs designated as toxic by WHO (Toxics; also known as dioxin-like PCBs; DLPCBs) and the earliest and latest eluted congener at each level of chlorination (LOC CBs) are determined by the isotope dilution quantitation technique; the remaining congeners are determined by the internal standard quantitation technique.

1.1.3 This Method allows determination of the PCB toxicity equivalent (TEQ_{PCB}) for the Toxics in a sample using toxicity equivalency factors (TEFs; Reference 1) and allows unique determination of 19 of 21 CBs of interest to the National Oceanic and Atmospheric Administration (NOAA; Reference 2). A second-column option is provided for resolution of the two toxic PCB congeners (with IUPAC numbers 156 and 157) that are not resolved on the SPB-octyl column and for resolution of other CB congeners.

1.1.4 This Method also allows estimation of homolog totals by level of chlorination (LOC) and estimation of total CBs in a sample by summation of the concentrations of the CB congeners and congener groups.

1.1.5 The list of 209 CBs is given in Table 1 with the Toxics, the CBs of interest to NOAA, and the LOC CBs identified.

1.2 This Method is for use in data gathering and monitoring associated with the Clean Water Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental

Response, Compensation and Liability Act, and the Safe Drinking Water Act. It is based on a compilation of methods from the technical literature (References 3-5) and on EPA Method 1613.

1.3 The detection limits and quantitation levels in this Method are usually dependent on the level of interferences and laboratory background levels rather than instrumental limitations. The estimated minimum levels of quantitation (EMLs) in Table 2 are the levels at which the CBs can be determined with laboratory contamination present. The estimated method detection limit (EMDL) for CB 126 in water is 5 pg/L (picograms-per-liter; parts-per-quadrillion) with no interferences present.

1.4 The GC/MS portions of this Method are for use only by analysts experienced with HRGC/HRMS or under the close supervision of such qualified persons. Each laboratory that uses this Method must demonstrate the ability to generate acceptable results using the procedure in Section 9.2.

1.5 This Method is "performance-based." The laboratory is permitted to modify the Method to overcome interferences or lower the cost of measurements, provided that all performance criteria are met. The requirements for establishing Method equivalency are given in Section 9.1.2.

1.6 Any modification of this Method, beyond those expressly permitted, shall be considered a major modification subject to application and approval of alternate test procedures under 40 CFR 136.4 and 136.5.

2.0 Summary of Method

Flow charts that summarize procedures for sample preparation, extraction, and analysis are given in Figure 1 for aqueous and solid samples, Figure 2 for multi-phase samples, and Figure 3 for tissue samples.

2.1 Extraction

2.1.1 Aqueous samples (samples containing less than one percent solids)—Stable isotopically labeled analogs of the Toxics and labeled LOC CBs are spiked into a 1-L sample. The sample is extracted using solid-phase extraction (SPE), separatory funnel extraction (SFE), or continuous liquid/liquid extraction (CLLE).

2.1.2 Solid, semi-solid, and multi-phase samples (excluding tissue)—The labeled compounds are spiked into a sample containing 10 g (dry weight) of solids. Samples containing multiple phases are pressure filtered and any aqueous liquid is discarded. Coarse solids are ground or homogenized. Any non-aqueous liquid from multi-phase samples is combined with the solids and extracted in a Soxhlet/Dean-Stark (SDS) extractor. The extract is concentrated for cleanup.

2.1.3 Fish and other tissue—A 20-g aliquot of sample is homogenized, and a 10-g aliquot is spiked with the labeled compounds. The sample is mixed with anhydrous sodium sulfate, allowed to dry for 12 - 24 hours, and extracted for 18-24 hours using methylene chloride:hexane (1:1) in a Soxhlet extractor. The extract is evaporated to dryness, and the lipid content is determined.

2.2 After extraction, a labeled cleanup standard is spiked into the extract which is then cleaned up using back-extraction with sulfuric acid and/or base, and gel permeation, silica gel, or Florisil chromatography. Activated carbon and high-performance liquid chromatography (HPLC) can be used for further isolation of specific congener groups. Prior to the cleanup procedures cited above, tissue extracts are cleaned up using an anthropogenic isolation column.

2.3 After cleanup, the extract is concentrated to 20 μL. Immediately prior to injection, labeled injection internal standards are added to each extract and an aliquot of the extract is injected into the gas chromatograph (GC). The analytes are separated by the GC and detected by a high-resolution ($\geq$10,000) mass spectrometer. Two exact m/z's are monitored at each level of chlorination (LOC) throughout a pre-determined retention time window.

2.4 An individual CB congener is identified by comparing the GC retention time and ion-abundance ratio of two exact m/z's with the corresponding retention time of an authentic standard and the theoretical or acquired ion-abundance ratio of the two exact m/z's. Isomer specificity for certain of the CB congeners is achieved using GC columns that resolve these congeners.

2.5 Quantitative analysis is performed in one of two ways using selected ion current profile (SICP) areas:

2.5.1 For the Toxics and the LOC CBs, the GC/MS is multi-point calibrated and the concentration is determined using the isotope dilution technique.

2.5.2 For all congeners other than the Toxics and LOC CBs, the GC/MS is calibrated at a single concentration and the concentrations are determined using the internal standard technique.

2.5.3 For the labeled Toxics, labeled LOC CBs, and the cleanup standards, the GC/MS is calibrated using replicates at a single concentration and the concentrations of these labeled compounds in samples are determined using the internal standard technique.

2.6 The quality of the analysis is assured through reproducible calibration and testing of the extraction, cleanup, and GC/MS systems.

3.0 Definitions

Definitions are given in the glossary at the end of this Method.

4.0 Contamination and interferences

4.1 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts, elevated baselines, and/or lock-mass suppression causing misinterpretation of chromatograms. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required. Where possible, reagents are cleaned by extraction or solvent rinse. Environmentally abundant CBs, as well as toxic congeners 105, 114, 118, 123, 156, 157, and 167 have been shown to be very difficult to completely eliminate from the laboratory at levels lower than the EMDLs in this Method (Table 2), and baking of glassware in a kiln or furnace at 450 - 500 °C may be necessary to remove these and other contaminants.

4.2 Proper cleaning of glassware is extremely important, because glassware may not only contaminate the samples but may also remove the analytes of interest by adsorption on the glass surface.

4.2.1 Glassware should be rinsed with solvent and washed with a detergent solution as soon after use as is practical. Sonication of glassware containing a detergent solution for approximately 30 seconds may aid in cleaning. Glassware with removable parts, particularly separatory funnels with fluoropolymer stopcocks, must be disassembled prior to detergent washing.

4.2.2 After detergent washing, glassware should be rinsed immediately, first with methanol, then with hot tap water. The tap water rinse is followed by another methanol rinse, then acetone, and then methylene chloride.

4.2.3 Baking of glassware in a kiln or other high temperature furnace (300 - 500 °C) may be warranted after particularly dirty samples are encountered. The kiln or furnace should be vented to prevent laboratory contamination by CB vapors. Baking should be minimized, as repeated baking of glassware may cause active sites on the glass surface that may irreversibly adsorb CBs.

4.2.4 Immediately prior to use, the Soxhlet apparatus should be pre-extracted with toluene for approximately 3 hours (see Sections 12.3.1-12.3.3). The extraction apparatus (Section 6.4) should be rinsed with methylene chloride/toluene (80/20 mixture).

4.2.5 A separate set of glassware may to necessary to effectively preclude contamination when low-level samples are analyzed.

4.3 All materials used in the analysis must be demonstrated to be free from interferences by running reference matrix method blanks (Section 9.5) initially and with each sample batch (samples started through the extraction process on a given 12-hour shift, to a maximum of 20 samples).

4.3.1 The reference matrix must simulate, as closely as possible, the sample matrix under test. Ideally, the reference matrix should not contain the CBs in detectable amounts, but should contain potential interferents in the concentrations expected to be found in the samples to be analyzed.

4.3.2 When a reference matrix that simulates the sample matrix under test is not available, reagent water (Section 7.6.1) can be used to simulate water samples; playground sand (Section 7.6.2) or white quartz sand (Section 7.3.2) can be used to simulate soils; filter paper (Section 7.6.3) can be used to simulate papers and similar materials; and corn oil (Section 7.6.4) can be used to simulate tissues.

4.4 Interferences co-extracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the CBs. The most frequently encountered interferences are chlorinated dioxins and dibenzofurans, methoxy biphenyls, hydroxydiphenyl ethers, benzylphenyl ethers, brominated diphenyl ethers, polynuclear aromatics, polychlorinated naphthalenes, and pesticides. Because very low levels of CBs are measured by this Method, the elimination of interferences is essential. The cleanup steps given in Section 13 can be used to reduce or eliminate these interferences and thereby permit reliable determination of the CBs at the levels shown in Table 2.

4.5 Each piece of reusable glassware should be numbered to associate that glassware with the processing of a particular sample. This will assist the laboratory in tracking possible sources of contamination for individual samples, identifying glassware associated with highly contaminated samples that may require extra cleaning, and determining when glassware should be discarded.

4.6 Contamination of calibration solutions—The EMDLs and EMLs in Table 2 are the levels that can be achieved with normal laboratory backgrounds present. Many of the EMLs are greater than the equivalent concentrations of the calibration solutions. In order to prevent contamination of the calibration solutions with the backgrounds allowed by the EMLs, the calibration solutions must be prepared in an area free from CB contamination using glassware free from contamination. If these requirements cannot be met or are difficult to meet in the laboratory, the laboratory should prepare the calibration solutions in a contamination-free facility or have a vendor prepare the calibration standards and guarantee freedom from contamination.

4.7 Cleanup of tissue—The natural lipid content of tissue can interfere in the analysis of tissue samples for the CBs. The lipid contents of different species and portions of tissue

can vary widely. Lipids are soluble to varying degrees in various organic solvents and may be present in sufficient quantity to overwhelm the column chromatographic cleanup procedures used for cleanup of sample extracts. Lipids must be removed by the anthropogenic isolation column procedure in Section 13.6, followed by the gel permeation chromatography procedure in Section 13.2. Florisil (Section 13.7) is recommended as an additional cleanup step.

4.8 If the laboratory air is a potential source of CB contamination, samples, reagents, glassware, and other materials should be dried in a glove box or other area free from contamination.

5.0 Safety

5.1 The toxicity or carcinogenicity of each chemical used in this Method has not been precisely determined; however, each compound should be treated as a potential health hazard. Exposure to these compounds should be reduced to the lowest possible level.

5.1.1 PCBs have been tentatively classified as known or suspected human or mammalian carcinogens. On the basis of the available toxicological and physical properties of the CBs, pure standards should be handled only by highly trained personnel thoroughly familiar with handling and cautionary procedures and the associated risks.

5.1.2 It is recommended that the laboratory purchase dilute standard solutions of the analytes in this Method. However, if primary solutions are prepared, they must be prepared in a hood, and a NIOSH/MESA approved toxic gas respirator must be worn when high concentrations are handled.

5.2 The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this Method. A reference file of material safety data sheets (MSDSs) should also be made available to all personnel involved in these analyses. It is also suggested that the laboratory perform personal hygiene monitoring of each analyst who uses this Method and that the results of this monitoring be made available to the analyst. Additional information on laboratory safety can be found in References 6-9. The references and bibliography at the end of Reference 8 are particularly comprehensive in dealing with the general subject of laboratory safety.

5.3 The pure CBs and samples suspected to contain these compounds are handled using essentially the same techniques employed in handling radioactive or infectious materials. Well-ventilated, controlled access laboratories are required. Assistance in evaluating the health hazards of particular laboratory conditions may be obtained from certain consulting laboratories and from State Departments of Health or Labor, many of which have an industrial health service. Each laboratory must develop a strict safety program for handling these compounds. The practices in Reference 10 for handling chlorinated

dibenzo-*p*-dioxins and dibenzofurans (CDDs/CDFs) are also recommended for handling the CBs.

5.3.1 Facility—When finely divided samples (dusts, soils, dry chemicals) are handled, all operations (including removal of samples from sample containers, weighing, transferring, and mixing) should be performed in a glove box demonstrated to be leak tight or in a fume hood demonstrated to have adequate air flow. Gross losses to the laboratory ventilation system must not be allowed. Handling of the dilute solutions normally used in analytical and animal work presents no inhalation hazards except in the case of an accident.

5.3.2 Protective equipment—Disposable plastic gloves, apron or lab coat, safety glasses or mask, and a glove box or fume hood adequate for radioactive work should be used. During analytical operations that may give rise to aerosols or dusts, personnel should wear respirators equipped with activated carbon filters. Eye protection (preferably full face shields) must be worn while working with exposed samples or pure analytical standards. Latex gloves are commonly used to reduce exposure of the hands. When handling samples suspected or known to contain high concentrations of the CBs, an additional set of gloves can also be worn beneath the latex gloves.

5.3.3 Training—Workers must be trained in the proper method of removing contaminated gloves and clothing without contacting the exterior surfaces.

5.3.4 Personal hygiene—Hands and forearms should be washed thoroughly after each manipulation and before breaks (coffee, lunch, and shift).

5.3.5 Confinement—Isolated work areas posted with signs, segregated glassware and tools, and plastic absorbent paper on bench tops will aid in confining contamination.

5.3.6 Effluent vapors—The effluent of the sample splitter from the gas chromatograph (GC) and from roughing pumps on the mass spectrometer (MS) should pass through either a column of activated charcoal or be bubbled through a trap containing oil or high-boiling alcohols to condense CB vapors.

5.3.7 Waste Handling—Good technique includes minimizing contaminated waste. Plastic bag liners should be used in waste cans. Janitors and other personnel should be trained in the safe handling of waste.

5.3.8 Decontamination.

5.3.8.1 Decontamination of personnel—Use any mild soap with plenty of scrubbing action.

5.3.8.2 Glassware, tools, and surfaces—Chlorothene NU Solvent is a less toxic solvent that should be effective in removing CBs. Satisfactory cleaning may be accomplished by rinsing with Chlorothene, then washing with any detergent and water. If glassware is first rinsed with solvent, the wash water may be disposed of in the sewer. Given the cost of disposal, it is prudent to minimize solvent wastes.

5.3.9 Laundry—Clothing known to be contaminated should be collected in plastic bags. Persons that convey the bags and launder the clothing should be advised of the hazard and trained in proper handling. The clothing may be put into a washer without contact if the launderer knows of the potential problem. The washer should be run through a cycle before being used again for other clothing.

5.3.10 Wipe tests—A useful method of determining cleanliness of work surfaces and tools is to perform a wipe test of the surface suspected of being contaminated.

5.3.10.1 Using a piece of filter paper moistened with Chlorothene or other solvent, wipe an area approximately 10 x 10 cm.

5.3.10.2 Extract and analyze the wipe by GC with an electron capture detector (ECD) or by this Method.

5.3.10.2 Using the area wiped (e.g., 10 x 10 cm = 0.01 m^2), calculate the concentration in $\mu g/m^2$. A concentration less than 1 $\mu g/m^2$ indicates acceptable cleanliness; anything higher warrants further cleaning. More than 100 $\mu g/m^2$ constitutes an acute hazard and requires prompt cleaning before further use of the equipment or work space, and indicates that unacceptable work practices have been employed.

6.0 Apparatus and materials

Note: *Brand names, suppliers, and part numbers are for illustration purposes only and no endorsement is implied. Equivalent performance may be achieved using apparatus and materials other than those specified here. Meeting the performance requirements of this Method is the responsibility of the laboratory.*

6.1 Sampling equipment for discrete or composite sampling

6.1.1 Sample bottles and caps.

6.1.1.1 Liquid samples (waters, sludges and similar materials containing 5 percent solids or less)—Sample bottle, amber glass, 1.1-L minimum, with screw cap.

6.1.1.2 Solid samples (soils, sediments, sludges, paper pulps, filter cake, compost, and similar materials that contain more than 5 percent solids)—Sample bottle, wide mouth, amber glass, 500-mL minimum.

6.1.1.3 If amber bottles are not available, samples must be protected from light.

6.1.1.4 Bottle caps—Threaded to fit sample bottles. Caps must be lined with fluoropolymer.

6.1.1.5 Cleaning

6.1.1.5.1 Bottles are detergent water washed, then solvent rinsed before use.

6.1.1.5.2 Liners are detergent water washed and rinsed with reagent water (Section 7.6.1).

6.1.2 Compositing equipment—Automatic or manual compositing system incorporating glass containers cleaned per bottle cleaning procedure above. Only glass or fluoropolymer tubing must be used. If the sampler uses a peristaltic pump, a minimum length of compressible silicone rubber tubing may be used in the pump only. Before use, the tubing must be thoroughly rinsed with methanol, followed by repeated rinsing with reagent water to minimize sample contamination. An integrating flow meter is used to collect proportional composite samples.

6.2 Equipment for glassware cleaning

Note: *If blanks from bottles or other glassware or with fewer cleaning steps than required above show no detectable CB contamination, unnecessary cleaning steps and equipment may be eliminated.*

6.2.1 Laboratory sink with overhead fume hood

6.2.2 Kiln—Capable of reaching 450 °C within 2 hours and maintaining 450 - 500 °C within ± 10 °C, with temperature controller and safety switch (Cress Manufacturing Co, Santa Fe Springs, CA, B31H, X31TS, or equivalent). See the precautions in Section 4.2.3.

6.3 Equipment for sample preparation

6.3.1 Laboratory fume hood of sufficient size to contain the sample preparation equipment listed below.

6.3.2 Glove box (optional)

6.3.3 Tissue homogenizer—VirTis Model 45 Macro homogenizer (American Scientific Products H-3515, or equivalent) with stainless steel Macro-shaft and Turbo-shear blade.

6.3.4 Meat grinder—Hobart, or equivalent, with 3- to 5-mm holes in inner plate.

6.3.5 Equipment for determining percent moisture

6.3.5.1 Oven—Capable of maintaining a temperature of 110 ± 5 °C

6.3.5.2 Desiccator

6.3.6 Balances

6.3.6.1 Analytical—Capable of weighing 0.1 mg

6.3.6.2 Top loading—Capable of weighing 10 mg

6.4 Extraction apparatus

6.4.1 Water samples

6.4.1.1 pH meter, with combination glass electrode

6.4.1.2 pH paper, wide range (Hydrion Papers, or equivalent)

6.4.1.3 Graduated cylinder, 1-L capacity

6.4.1.4 Liquid/liquid extraction—Separatory funnels, 250-, 500-, and 2000-mL, with fluoropolymer stopcocks

6.4.1.5 Solid-phase extraction

6.4.1.5.1 1-L filtration apparatus, including glass funnel, frit support, clamp, adapter, stopper, filtration flask, and vacuum tubing (Figure 4). For wastewater samples, the apparatus should accept 90 or 144 mm disks. For drinking water or other samples containing low solids, smaller disks may be used.

6.4.1.5.2 Vacuum source—Capable of maintaining 25 in. Hg, equipped with shutoff valve and vacuum gauge

6.4.1.5.3 Glass-fiber filter—Whatman GMF 150 (or equivalent), 1 micron pore size, to fit filtration apparatus in Section 6.4.1.5.1

6.4.1.5.4 Solid-phase extraction disk containing octadecyl (C_{18}) bonded silica uniformly enmeshed in an inert matrix—Fisher Scientific 14-378F (or equivalent), to fit filtration apparatus in Section 6.4.1.5.1

6.4.1.6 Continuous liquid/liquid extraction (CLLE)—Fluoropolymer or glass connecting joints and stopcocks without lubrication, 1.5-2 L capacity (Hershberg-Wolf Extractor, Cal-Glass, Costa Mesa, California, 1000 mL or 2000 mL, or equivalent).

6.4.2 Soxhlet/Dean-Stark (SDS) extractor (Figure 5 and Reference 11) for filters and solid/sludge samples

6.4.2.1 Soxhlet—50-mm ID, 200-mL capacity with 500-mL flask (Cal-Glass LG-6900, or equivalent, except substitute 500-mL round-bottom flask for 300-mL flat-bottom flask)

6.4.2.2 Thimble—43 × 123 to fit Soxhlet (Cal-Glass LG-6901-122, or equivalent)

6.4.2.3 Moisture trap—Dean Stark or Barret with fluoropolymer stopcock, to fit Soxhlet

6.4.2.4 Heating mantle—Hemispherical, to fit 500-mL round-bottom flask (Cal-Glass LG-8801-112, or equivalent)

6.4.2.5 Variable transformer—Powerstat (or equivalent), 110-volt, 10-amp

6.4.3 Beakers—400- to 500-mL

6.4.4 Spatulas—Stainless steel

6.5 Filtration apparatus

6.5.1 Pyrex glass wool—Solvent-extracted using a Soxhlet or SDS extractor for 3 hours minimum

6.5.2 Glass funnel—125- to 250-mL

6.5.3 Glass-fiber filter paper—Whatman GF/D (or equivalent), to fit glass funnel in Section 6.5.2.

6.5.4 Drying column—15- to 20-mm ID Pyrex chromatographic column equipped with coarse-glass frit or glass-wool plug

6.5.5 Buchner funnel—15-cm

6.5.6 Glass-fiber filter paper for Buchner funnel above

6.5.7 Filtration flasks—1.5- to 2.0-L, with side arm

6.5.8 Pressure filtration apparatus—Millipore YT30 142 HW, or equivalent

6.6 Centrifuge apparatus

6.6.1 Centrifuge—Capable of rotating 500-mL centrifuge bottles or 15-mL centrifuge tubes at 5,000 rpm minimum

6.6.2 Centrifuge bottles—500-mL, with screw-caps, to fit centrifuge

6.6.3 Centrifuge tubes—12- to 15-mL, with screw-caps, to fit centrifuge

6.7 Cleanup apparatus

6.7.1 Automated gel permeation chromatograph (Analytical Biochemical Labs, Inc, Columbia, MO, Model GPC Autoprep 1002, or equivalent)

6.7.1.1 Column—600-700 mm long × 25 mm ID glass, packed with 70 g of 200-400 mesh SX-3 Bio-beads (Bio-Rad Laboratories, Richmond, CA, or equivalent)

6.7.1.2 Syringe—10-mL, with Luer fitting

6.7.1.3 Syringe filter holder—stainless steel, and glass-fiber or fluoropolymer filters (Gelman 4310, or equivalent)

6.7.1.4 UV detectors—254-nm, preparative or semi-preparative flow cell (Isco, Inc., Type 6; Schmadzu, 5-mm path length; Beckman-Altex 152W, 8-μL micro-prep flow cell, 2-mm path; Pharmacia UV-1, 3-mm flow cell; LDC Milton-Roy UV-3, monitor #1203; or equivalent)xxx

6.7.2 Reverse-phase high-performance liquid chromatograph (Reference 4)

6.7.2.1 Pump—Perkin-Elmer Series 410, or equivalent

6.7.2.2 Injector—Perkin-Elmer ISS-100 Autosampler, or equivalent

6.7.2.3 6-Port switching valve—Valco N60, or equivalent

6.7.2.4 Column—Hypercarb, 100 x 4.6 mm, 5 μm particle size, Keystone Scientific, or equivalent

6.7.2.5 Detector—Altex 110A (or equivalent) operated at 0.02 AUFS at 235 nm

6.7.2.6 Fraction collector—Isco Foxy II, or equivalent

6.7.3 Pipets

6.7.3.1 Disposable, Pasteur, 150-mm long × 5-mm ID (Fisher Scientific 13-678-6A, or equivalent)

6.7.3.2 Disposable, serological, 50-mL (8- to 10- mm ID)

6.7.4 Glass chromatographic columns

6.7.4.1 150-mm long × 8-mm ID, (Kontes K-420155, or equivalent) with coarse-glass frit or glass-wool plug and 250-mL reservoir

6.7.4.2 200-mm long × 15-mm ID, with coarse-glass frit or glass-wool plug and 250-mL reservoir

6.7.4.3 300-mm long x 22-mm ID, with coarse-glass frit, 300-mL reservoir, and glass or fluoropolymer stopcock

6.7.5 Oven—For baking and storage of adsorbents, capable of maintaining a constant temperature (±5 °C) in the range of 105-250 °C

6.8 Concentration apparatus

6.8.1 Rotary evaporator—Buchi/Brinkman-American Scientific No. E5045-10 or equivalent, equipped with a variable temperature water bath

6.8.1.1 Vacuum source for rotary evaporator equipped with shutoff valve at the evaporator and vacuum gauge

6.8.1.2 A recirculating water pump and chiller are recommended, as use of tap water for cooling the evaporator wastes large volumes of water

and can lead to inconsistent performance as water temperatures and pressures vary.

6.8.1.3 Round-bottom flask—100-mL and 500-mL or larger, with ground-glass fitting compatible with the rotary evaporator

6.8.2 Kuderna-Danish (K-D) concentrator

6.8.2.1 Concentrator tube—10-mL, graduated (Kontes K-570050-1025, or equivalent) with calibration verified. Ground-glass stopper (size 19/22 joint) is used to prevent evaporation of extracts.

6.8.2.2 Evaporation flask—500-mL (Kontes K-570001-0500, or equivalent), attached to concentrator tube with springs (Kontes K-662750-0012 or equivalent)

6.8.2.3 Snyder column—Three-ball macro (Kontes K-503000-0232, or equivalent)

6.8.2.4 Boiling chips

6.8.2.4.1 Glass or silicon carbide—Approximately 10/40 mesh, extracted with methylene chloride and baked at 450 °C for one hour minimum

6.8.2.4.2 Fluoropolymer (optional)—Extracted with methylene chloride

6.8.2.5 Water bath—Heated, with concentric ring cover, capable of maintaining a temperature within ±2 °C, installed in a fume hood

6.8.3 Nitrogen blowdown apparatus—Equipped with water bath controlled in the range of 30 - 60 °C (N-Evap, Organomation Associates, Inc., South Berlin, MA, or equivalent), installed in a fume hood

6.8.4 Sample vials

6.8.4.1 Amber glass, 2- to 5-mL with fluoropolymer-lined screw-cap

6.8.4.2 Glass, 0.3-mL, conical, with fluoropolymer-lined screw or crimp cap

6.9 Gas chromatograph—Must have splitless or on-column injection port for capillary column, temperature program with isothermal hold, and must meet all of the performance specifications in Section 10.

6.9.1 GC column—Any GC column or column system (2 or more columns) that provides unique resolution and identification of the Toxics for determination of a TEQ_{PCB} using TEFs (Reference 1). Isomers may be unresolved so long as they have the same TEF and response factor and so long as these unresolved isomers are uniquely resolved from all other congeners. For example, the SPB-octyl column (Section 6.9.1.3) achieves unique GC resolution of all Toxics except congeners with IUPAC numbers 156 and 157. This isomeric pair is uniquely resolved from all other congeners and these congeners have the same TEF and response factor.

6.9.1.1 If an SPB-octyl column is used, it must meet the specification in Section 6.9.1 and the following additional specifications:

6.9.1.1.1 The retention time for decachlorobiphenyl (DFB; PCB 209) must be greater than 55 minutes.

6.9.1.1.2 The column must uniquely resolve congeners 34 from 23 and 187 from 182, and congeners 156 and 157 must co-elute within 2 seconds at the peak maximum. Unique resolution means a valley height less than 40 percent of the shorter of the two peaks that result when the Diluted combined 209 congener solution (Section 7.10.2.2) is analyzed (see Figures 6 and 7).

6.9.1.1.3 The column must be replaced when any of the criteria in Sections 6.9.1 - 6.9.1.1.2 are not met.

6.9.1.2 If a column or column system alternate to the SPB-octyl column is used, specifications similar to those for the SPB-octyl column (Sections 6.9.1 - 6.9.1.1.2) must be developed and be functionally equivalent to those specifications.

6.9.1.3 Suggested column—30±5-m long × 0.25±0.02-mm ID; 0.25-μm film SPB-octyl (Supelco 2-4218, or equivalent). This column is capable of meeting the requirements in Sections 6.9.1 - 6.9.1.1.2.

Note: *The SPB-octyl column is subject to rapid degradation when exposed to oxygen. The analyst should exclude oxygen from the carrier gas, should eliminate air leaks, and should cool the injector, column, and transfer line before opening the column to the atmosphere. For further information on precluding oxidation, contact the column manufacturer.*

6.9.1.4 Column for resolution of additional congeners—See Annex A for details on the DB-1 column. The DB-1 column is optional and is capable of uniquely resolving the congener pair with IUPAC

156 and 157. When used in combination with the SPB-octyl column (Section 6.9.1.3), the two-column system is capable of resolving a total of approximately 180 CB congeners.

6.10 Mass spectrometer—28- to 40-eV electron impact ionization, must be capable of selectively monitoring a minimum of 22 exact m/z's minimum at high resolution (≥10,000) during a period less than 1.5 seconds, and must meet all of the performance specifications in Section 10.

6.11 GC/MS interface—The mass spectrometer (MS) must be interfaced to the GC such that the end of the capillary column terminates within 1 cm of the ion source but does not intercept the electron or ion beams.

6.12 Data system—Capable of collecting, recording, storing, and processing MS data

6.12.1 Data acquisition—The signal at each exact m/z must be collected repetitively throughout the monitoring period and stored on a mass storage device.

6.12.2 Response factors and multipoint calibrations—The data system must record and maintain lists of response factors (response ratios for isotope dilution) and multipoint calibrations. Computations of relative standard deviation (RSD) are used to test calibration linearity. Statistics on initial (Section 9.4) and ongoing (Section 15.5.4) performance should be computed and maintained, either on the instrument data system, or on a separate computer system.

7.0 Reagents and standards

7.1 pH adjustment and back-extraction

7.1.1 Potassium hydroxide—Dissolve 20 g reagent grade KOH in 100 mL reagent water.

7.1.2 Sulfuric acid—Reagent grade (specific gravity 1.84)

7.1.3 Hydrochloric acid—Reagent grade, 6N

7.1.4 Sodium chloride—Reagent grade, prepare at 5% (w/v) solution in reagent water

7.2 Solution drying and evaporation

7.2.1 Solution drying—Sodium sulfate, reagent grade, granular, anhydrous (Baker 3375, or equivalent), rinsed with methylene chloride (20 mL/g), baked at 400 °C for 1 hour minimum, cooled in a desiccator, and stored in a pre-cleaned glass bottle with screw-cap that prevents moisture from entering. If, after heating, the sodium sulfate develops a noticeable grayish cast (due to the presence of carbon

in the crystal matrix), that batch of reagent is not suitable for use and should be discarded. Extraction with methylene chloride (as opposed to simple rinsing) and baking at a lower temperature may produce sodium sulfate that is suitable for use.

7.2.2 Tissue drying—Sodium sulfate, reagent grade, powdered, treated and stored as in Section 7.2.1

7.2.3 Prepurified nitrogen

7.3 Extraction

7.3.1 Solvents—Acetone, toluene, cyclohexane, hexane, methanol, methylene chloride, isooctane, and nonane; distilled in glass, pesticide quality, lot-certified to be free of interferences

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Note: *Some solvents; e.g., isooctane and nonane, may need to be re-distilled to eliminate CB backgrounds.*

7.3.2 White quartz sand, 60/70 mesh—For Soxhlet/Dean-Stark extraction (Aldrich Chemical, Cat. No. 27-437-9, or equivalent). Bake at 450 °C for 4 hour minimum.

7.4 GPC calibration solution—Prepare a solution containing 2.5 mg/mL corn oil, 0.05 mg/mL bis(2-ethylhexyl) phthalate (BEHP), 0.01 mg/mL methoxychlor, 0.002 mg/mL perylene, and 0.008 mg/mL sulfur, or at concentrations appropriate to the response of the detector.

7.5 Adsorbents for sample cleanup

7.5.1 Silica gel

7.5.1.1 Activated silica gel—100-200 mesh, Supelco 1-3651 (or equivalent), rinsed with methylene chloride, baked at 180 °C for a minimum of 1 hour, cooled in a desiccator, and stored in a precleaned glass bottle with screw-cap that prevents moisture from entering.

7.5.1.2 Acid silica gel (30% w/w)—Thoroughly mix 44 g of concentrated sulfuric acid with 100 g of activated silica gel in a clean container. Break up aggregates with a stirring rod until a uniform mixture is obtained. Store in a screw-capped bottle with fluoropolymer-lined cap.

7.5.1.3 Basic silica gel—Thoroughly mix 30 g of 1N sodium hydroxide with 100 g of activated silica gel in a clean container. Break up aggregates with a stirring rod until a uniform mixture is obtained. Store in a screw-capped bottle with fluoropolymer-lined cap.

7.5.1.4 Potassium silicate

7.5.1.4.1 Dissolve 56 g of high purity potassium hydroxide (Aldrich, or equivalent) in 300 mL of methanol in a 750- to 1000-mL flat-bottom flask.

7.5.1.4.2 Add 100 g of activated silica gel (Section 7.5.1.1) and a stirring bar, and stir on an explosion-proof hot plate at 60-70 °C for 1-2 hours.

7.5.1.4.3 Decant the liquid and rinse the potassium silicate twice with 100-mL portions of methanol, followed by a single rinse with 100 mL of methylene chloride.

7.5.1.4.4 Spread the potassium silicate on solvent-rinsed aluminum foil and dry for 2-4 hours in a hood. Observe the precaution in Section 4.8.

7.5.1.4.5 Activate overnight at 200-250 °C prior to use.

7.5.2 Carbon

7.5.2.1 Carbopak C—(Supelco 1-0258, or equivalent)

7.5.2.2 Celite 545—(Supelco 2-0199, or equivalent)

7.5.2.3 Thoroughly mix 18.0 g Carbopak C and 18.0 g Celite 545 to produce a 50% w/w mixture. Activate the mixture at 130 °C for a minimum of 6 hours. Store in a desiccator.

Note: *The carbon column has been included in this Method to allow separation of co-planar congeners 77, 126, and 169 from other congeners and interferences, should such separation be desired.*

7.5.3 Anthropogenic isolation column—Pack the column in Section 6.7.4.3 from bottom to top with the following:

7.5.3.1 2 g silica gel (Section 7.5.1.1)

7.5.3.2 2 g potassium silicate (Section 7.5.1.4)

7.5.3.3 2 g granular anhydrous sodium sulfate (Section 7.2.1)

7.5.3.4 10 g acid silica gel (Section 7.5.1.2)

7.5.3.5 2 g granular anhydrous sodium sulfate

7.5.4 Florisil column

7.5.4.1 Florisil—PR grade, 60-100 mesh (U.S. Silica Corp, Berkeley Springs, WV, or equivalent). Alternatively, prepacked Florisil columns may be used. Use the following procedure for Florisil activation and column packing.

7.5.4.1.1 Fill a clean 1- to 2-L bottle 1/2 to 2/3 full with Florisil and place in an oven at 130-150 °C for a minimum of three days to activate the Florisil.

7.5.4.1.2 Immediately prior to use, dry pack a 300-mm x 22-mm ID glass column (Section 6.7.4.3) bottom to top with 0.5-1.0 cm of warm to hot anhydrous sodium sulfate (Section 7.2.1), 10-10.5 cm of warm to hot activated Florisil (Section 7.5.4.1.1), and 1-2 cm of warm to hot anhydrous sodium sulfate. Allow the column to cool and wet immediately with 100 mL of n-hexane to prevent water from entering.

7.5.4.2 Using the procedure in Section 13.7.3, establish the elution pattern for each carton of Florisil or each lot of Florisil columns received.

7.6 Reference matrices—Matrices in which the CBs and interfering compounds are not detected by this Method

7.6.1 Reagent water—Bottled water purchased locally, or prepared by passage through activated carbon

7.6.2 High-solids reference matrix—Playground sand or similar material. Prepared by extraction with methylene chloride and/or baking at 450 °C for a minimum of 4 hours.

7.6.3 Paper reference matrix—Glass-fiber filter, Gelman type A, or equivalent. Cut paper to simulate the surface area of the paper sample being tested.

7.6.4 Tissue reference matrix—Corn or other vegetable oil.

7.6.5 Other matrices—This Method may be verified on any reference matrix by performing the tests given in Section 9.2. Ideally, the matrix should be free of the CBs, but in no case must the background level of the CBs in the reference matrix exceed the minimum levels in Table 2. If low background levels of the CBs are present in the reference matrix, the spike level of the analytes used in Section 9.2 should be increased to provide a spike-to-background ratio of approximately 5 (Reference 11).

7.7 Standard solutions—Prepare from materials of known purity and composition or purchase as solutions or mixtures with certification to their purity, concentration, and authenticity. If the chemical purity is 98 % or greater, the weight may be used without correction to calculate the concentration of the standard. Observe the safety precautions in Section 5 and the recommendation in Section 5.1.2.

7.7.1 For preparation of stock solutions from neat materials, dissolve an appropriate amount of assayed reference material in solvent. For example, weigh 1 to 2 mg of PCB 126 to three significant figures in a 10-mL ground-glass-stoppered volumetric flask and fill to the mark with nonane. After the compound is completely dissolved, transfer the solution to a clean 15-mL vial with fluoropolymer-lined cap.

7.7.2 When not being used, store standard solutions in the dark at room temperature in screw-capped vials with fluoropolymer-lined caps. Place a mark on the vial at the level of the solution so that solvent loss by evaporation can be detected. Replace the solution if solvent loss has occurred.

7.8 Native (unlabeled) stock solutions

7.8.1 Native Toxics/LOC stock solution—Prepare to contain the native Toxics and LOC CBs at the concentrations shown in Table 3, or purchase Accu-Standard M1668A-C-NT-LOC-WD-GCPC, or equivalent. If additional CBs are to be determined by isotope dilution (e.g., 170 and 180), include the additional native compounds in this stock solution.

7.8.2 Native 209 CB congener stock solutions—Solutions containing CB congeners to calibrate the SPB-octyl column.

Note: *If a column other than the SPB-octyl column is used, solutions that will allow separation of all 209 congeners on that column must be prepared.*

7.8.2.1 Native congener mix stock solutions for separation of individual congeners on the SPB-octyl column—Prepare the five solutions with the congeners listed in Table 4 at the concentrations shown in Table

3 or purchase Accu-Standard M-1668A-1, M-1668A-2, M-1668A-3, M-1668-4, and M-1668-5, or equivalent.

7.8.2.2 Combined 209 congener stock solution—Combine equal volumes of the standards in Section 7.8.2.1 to form a stock solution containing all CB congeners. This solution will be at 1/5 the concentration of the 5 individual solutions.

7.8.3 Stock solutions should be checked for signs of degradation prior to the preparation of calibration or performance test standards. Reference standards that can be used to determine the accuracy of standard solutions are available from several vendors.

7.9 Labeled compound stock solutions (Table 3)

7.9.1 Labeled Toxics/LOC/window-defining stock solution—Prepare in isooctane or nonane at the concentrations in Table 3 or purchase Cambridge Isotope Laboratories (CIL) EC-4977, or equivalent. If additional CBs are to be determined by isotope dilution (e.g., 170 and 180), include the additional labeled compounds in this stock solution.

7.9.2 Labeled cleanup standard stock solution-Prepare labeled CBs 28, 111, and 178 in iso-octane or nonane at the concentration shown in Table 3 or purchase CIL EC-4978, or equivalent.

7.9.3 Labeled injection internal standard stock solution—Prepare labeled CBs 9, 52, 101, 138, and 194 in nonane or isooctane at the concentrations shown in Table 3, or purchase CIL EC-4979, or equivalent.

7.10 Calibration standards

7.10.1 Calibration standards—Combine and dilute the solutions in Sections 7.8.1 and 7.9 to produce the calibration solutions in Table 5 or purchase CIL EC-4976, or equivalent, for the CS-1 to CS-5 set of calibration solutions. If a 6-point calibration is used, prepare the CS-0.2 solution or purchase CIL EC-4976-0.2, or equivalent. These solutions permit the relative response (labeled to native) and response factor to be measured as a function of concentration. The CS-3 standard (CIL EC-4976-3, or equivalent) is used for calibration verification (VER).

7.10.2 Solutions of congener mixes

7.10.2.1 Diluted individual solutions

7.10.2.1.1 The 5 individual solutions, when analyzed individually,

allow resolution of all 209 congeners on the SPB-octyl column, and are used for establishing retention time and other data for each congener. The elution order of the congeners present in each of the 5 solutions (Section 7.8.2.1) is given in Table 4.

7.10.2.1.2 Individually combine an aliquot of each individual mix stock solution (Section 7.8.2.1) with an aliquot of the Labeled Toxics/LOC/window-defining stock solution (Section 7.9.1), the Labeled cleanup standard stock solution (Section 7.9.2), and the Labeled injection internal standard stock solution (7.9.3) to produce concentrations of 100 ng/mL for the labeled compounds and 25, 50, and 75 ng/mL for the MoCB-TrCB, TeCB-HpCB, and OcCB-DeCB congeners, respectively, as shown in Table 3.

7.10.2.2 Diluted combined 209 congener solution

7.10.2.2.1 This solution combines the 5 individual mixes with the labeled compounds to allow single-point calibration of the congeners not included in the multi-point calibration, and establishes an average response factor for the co-eluting isomeric congeners.

7.10.2.2.2 Combine an aliquot of the combined 209 congener solution (Section 7.8.2.2) with an aliquot of the Labeled Toxics/LOC/window-defining stock solution (Section 7.9.1), the Labeled cleanup standard stock solution (Section 7.9.2), and the Labeled injection internal standard stock solution (7.9.3) to produce the same concentrations as in the diluted individual mix solutions (Section 7.10.2.1.2 and Table 3).

7.11 Native Toxics/LOC standard spiking solution—Used for determining initial precision and recovery (IPR; Section 9.2) and ongoing precision and recovery (OPR; Section 15.5). Dilute the Native Toxics/LOC stock solution (Section 7.8.1) with acetone to produce a concentration of the Toxics at 1 ng/mL, as shown in Table 3. When 1 mL of this solution spiked into the IPR (Section 9.2.1) or OPR (Section 15.5) and concentrated to a final volume of 20 μL, the concentration in the final volume will be 50 ng/mL (50 pg/μL). Prepare only the amount necessary for each reference matrix with each sample batch.

7.12 Labeled Toxics/LOC/window-defining standard spiking solution—This solution is spiked into each sample (Section 9.3) and into the IPR (Section 9.2.1), OPR (Section

15.5), and blank (Section 9.5) to measure recovery. Dilute the Labeled Toxics/LOC/ window-defining stock solution (Section 7.9.1) with acetone to produce a concentration of the labeled compounds at 2 ng/mL, as shown in Table 3. When 1 mL of this solution is spiked into an IPR, OPR, blank, or sample and concentrated to a final extract volume of 20 μL, the concentration in the final extract volume will be 100 ng/mL (100 pg/μL). Prepare only the amount necessary for each reference matrix with each sample batch.

7.13 Labeled cleanup standard spiking solution—This solution is spiked into each extract prior to cleanup to measure the efficiency of the cleanup process. Dilute the Labeled cleanup standard stock solution (Section 7.9.2) in methylene chloride to produce a concentration of the cleanup standards at 2 ng/mL, as shown in Table 3. When 1 mL of this solution is spiked into a sample extract and concentrated to a final volume of 20 μL, the concentration in the final volume will be 100 ng/mL (100 pg/μL).

7.14 Labeled injection internal standard spiking solution—This solution is added to each concentrated extract prior to injection into the HRGC/HRMS. Dilute the Labeled injection internal standard stock solution (Section 7.9.3) in nonane to produce a concentration of the injection internal standards at 1000 ng/mL, as shown in Table 3. When 2 μL of this solution is spiked into a 20 μL extract, the concentration of each injection internal standard will be nominally 100 ng/mL (100 pg/μL).

Note: *The addition of 2 μL of the Labeled injection internal standard spiking solution to a 20 μL final extract has the effect of diluting the concentration of the components in the extract by 10%. Provided all calibration solutions and all extracts undergo this dilution as a result of adding the Labeled injection internal standard spiking solution, the effect of the 10% solution is compensated, and correction for this dilution should not be made.*

7.15 QC Check Sample—A QC Check Sample should be obtained from a source independent of the calibration standards. Ideally, this check sample would be a certified Standard Reference Material (SRM) containing the CBs in known concentrations in a sample matrix similar to the matrix under test. The National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland has SRMs for several individual CB congeners, and as Aroclors in transformer and motor oil, in combination with pesticides in cod liver oil, and in combination with 2,3,7,8-TCDD in human serum.

7.16 Stability of solutions—Standard solutions used for quantitative purposes (Sections 7.9 through 7.14) should be assayed periodically (e.g., every 6 months) against SRMs from NIST (if available), or certified reference materials from a source that will attest to the authenticity and concentration, to assure that the composition and concentrations have not changed.

8.0 Sample collection, preservation, storage, and holding times

8.1 Collect samples in amber glass containers following conventional sampling practices (Reference 13).

8.2 Aqueous samples

8.2.1 Samples that flow freely are collected as grab samples or in refrigerated bottles using automatic sampling equipment.

8.2.2 If residual chlorine is present, add 80 mg sodium thiosulfate per liter of water. EPA Methods 330.4 and 330.5 may be used to measure residual chlorine (Reference 14).

8.2.3 Adjust sample pH 2-3 with sulfuric acid.

8.2.4 Maintain aqueous samples in the dark at 0-4 °C from the time of collection until receipt at the laboratory. Store in the dark at 0-4 °C.

8.3 Solid samples

8.3.4 Solid samples are collected as grab samples using wide-mouth jars.

8.3.4 Maintain solid, semi-solid, oily, and mixed-phase samples in the dark at <4 °C from the time of collection until receipt at the laboratory. Store solid, semi-solid, oily, and mixed-phase samples in the dark at <-10 °C.

8.4 Fish and other tissue samples

8.4.1 Fish may be cleaned, filleted, or processed in other ways in the field, such that the laboratory may expect to receive whole fish, fish fillets, or other tissues for analysis.

8.4.2 Fish collected in the field should be wrapped in aluminum foil, and must be maintained at a temperature less than 4 °C from the time of collection until receipt at the laboratory. Ideally, fish should be frozen upon collection and shipped to the laboratory under dry ice.

8.4.3 Tissue samples must be frozen upon receipt at the laboratory and maintained in the dark at <-10 °C until prepared. Maintain unused sample in the dark at <-10 °C.

8.5 Holding times

8.5.1 There are no demonstrated maximum holding times associated with the CBs in

aqueous, solid, semi-solid, tissues, or other sample matrices. If stored in the dark at 0-4 °C and preserved as given above (if required), aqueous samples may be stored for up to one year. Similarly, if stored in the dark at <-10 °C, solid, semi-solid, multi-phase, and tissue samples may be stored for up to one year.

8.5.2 Store sample extracts in the dark at <-10 °C until analyzed. If stored in the dark at <-10 °C, sample extracts may be stored for up to one year.

9.0 Quality assurance/quality control

9.1 Each laboratory that uses this Method is required to operate a formal quality assurance program (Reference 15). The minimum requirements of this program consist of an initial demonstration of laboratory capability, analysis of samples spiked with labeled compounds to evaluate and document data quality, and analysis of standards and blanks as tests of continued performance. Laboratory performance is compared to established performance criteria to determine if the results of analyses meet the performance characteristics of the Method.

If the Method is to be applied to sample matrix other than water (e.g., soils, filter cake, compost, tissue) the most appropriate alternate reference matrix (Sections 7.6.2 - 7.6.5 and 7.15) is substituted for the reagent water matrix (Section 7.6.1) in all performance tests.

9.1.1 The laboratory must make an initial demonstration of the ability to generate acceptable precision and recovery with this Method. This demonstration is given in Section 9.2.

9.1.2 In recognition of advances that are occurring in analytical technology, and to overcome matrix interferences, the laboratory is permitted certain options to improve separations or lower the costs of measurements. These options include alternate extraction, concentration, and cleanup procedures, and changes in columns and detectors. Alternate determinative techniques, such as the substitution of spectroscopic or immuno-assay techniques, and changes that degrade Method performance, are not allowed. If an analytical technique other than the techniques specified in this Method is used, that technique must have a specificity equal to or greater than the specificity of the techniques in this Method for the analytes of interest.

9.1.2.1 Each time a modification is made to this Method, the laboratory is required to repeat the procedure in Section 9.2. If the detection limit of the Method will be affected by the change, the laboratory is required to demonstrate that the MDLs (40 CFR Part 136, Appendix B) are lower than one-third the regulatory compliance level or one-third the EMDLs in this Method, whichever are greater. If calibration will be affected by the change, the instrument must be

recalibrated per Section 10.

9.1.2.2 The laboratory is required to maintain records of modifications made to this Method. These records include the following, at a minimum:

9.1.2.2.1 The names, titles, addresses, and telephone numbers of the analyst(s) that performed the analyses and modification, and of the quality control officer that witnessed and will verify the analyses and modifications.

9.1.2.2.2 A listing of pollutant(s) measured, by name and CAS Registry number.

9.1.2.2.3 A narrative stating reason(s) for the modifications.

9.1.2.2.4 Results from all quality control (QC) tests comparing the modified method to this Method, including:

a) Calibration (Section 10).
b) Calibration verification (Section 15.3).
c) Initial precision and recovery (Section 9.2).
d) Labeled compound recovery (Section 9.3).
e) Analysis of blanks (Section 9.5).
f) Accuracy assessment (Section 9.4).

9.1.2.2.5 Data that will allow an independent reviewer to validate each determination by tracing the instrument output (peak height, area, or other signal) to the final result. These data are to include:

a) Sample numbers and other identifiers.
b) Extraction dates.
c) Analysis dates and times.
d) Analysis sequence/run chronology.
e) Sample weight or volume (Section 11).
f) Extract volume prior to each cleanup step (Section 13).
g) Extract volume after each cleanup step (Section 13).
h) Final extract volume prior to injection (Section 14).
i) Injection volume (Section 14.3).
j) Dilution data, differentiating between dilution of a sample or extract (Section 17.5).

k) Instrument and operating conditions.
l) Column (dimensions, liquid phase, solid support, film thickness, etc).
m) Operating conditions (temperatures, temperature program, flow rates).
n) Detector (type, operating conditions, etc).
o) Chromatograms, printer tapes, and other recordings of raw data.
p) Quantitation reports, data system outputs, and other data to link the raw data to the results reported.

9.1.2.3 Alternate HRGC columns and column systems—See Sections 6.9.1. If a column or column system alternate to those specified in this Method is used, that column or column system must meet the requirements in Section 6.9.1 - 6.9.1.1.3.

9.1.3 Analyses of method blanks are required to demonstrate freedom from contamination (Section 4.3). The procedures and criteria for analysis of a method blank are described in Sections 9.5 and 15.6.

9.1.4 The laboratory must spike all samples with labeled compounds to monitor Method performance. This test is described in Section 9.3. When results of these spikes indicate atypical Method performance for samples, the samples are diluted to bring Method performance within acceptable limits. Procedures for dilution are given in Section 17.5.

9.1.5 The laboratory must, on an ongoing basis, demonstrate through calibration verification and the analysis of the ongoing precision and recovery standard (OPR) and blanks that the analytical system is in control. These procedures are given in Sections 15.1 through 15.6.

9.1.6 The laboratory should maintain records to define the quality of data generated. Development of accuracy statements is described in Section 9.4.

9.2 Initial precision and recovery (IPR)—To establish the ability to generate acceptable precision and recovery, the laboratory must perform the following operations.

9.2.1 For low solids (aqueous) samples, extract, concentrate, and analyze four 1-L aliquots of reagent water spiked with 1 mL each of the Native Toxics/LOC spiking solution (Section 7.11), the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12), and the Labeled cleanup standard spiking solution (Section 7.13), according to the procedures in Sections 11 through 18. For an alternative sample matrix, four aliquots of the alternative reference matrix (Section 7.6) are used. All sample processing steps that are to

be used for processing samples, including preparation (Section 11), extraction (Section 12), and cleanup (Section 13), must be included in this test.

9.2.2 Using results of the set of four analyses, compute the average percent recovery (X) of the extracts and the relative standard deviation (RSD) of the concentration for each compound, by isotope dilution for CBs with a labeled analog, and by internal standard for CBs without a labeled analog and for the labeled compounds.

9.2.3 For each CB and labeled compound, compare RSD and X with the corresponding limits for initial precision and recovery in Table 6. If RSD and X for all compounds meet the acceptance criteria, system performance is acceptable and analysis of blanks and samples may begin. If, however, any individual RSD exceeds the precision limit or any individual X falls outside the range for recovery, system performance is unacceptable for that compound. Correct the problem and repeat the test (Section 9.2).

9.3 To assess Method performance on the sample matrix, the laboratory must spike all samples with the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) and all sample extracts with the Labeled cleanup standard spiking solution (Section 7.13).

9.3.1 Analyze each sample according to the procedures in Sections 11 through 18.

9.3.2 Compute the percent recovery of the labeled Toxics/LOC/window-defining congeners and the labeled cleanup congeners using the internal standard method (Section 17.2).

9.3.3 The recovery of each labeled compound must be within the limits in Table 6. If the recovery of any compound falls outside of these limits, Method performance is unacceptable for that compound in that sample. Additional cleanup procedures must then be employed to attempt to bring the recovery within the normal range. If the recovery cannot be brought within the normal range after all cleanup procedures have been employed, water samples are diluted and smaller amounts of soils, sludges, sediments, and other matrices are analyzed per Section 18.

9.4 It is suggested but not required that recovery of labeled compounds from samples be assessed and records maintained.

9.4.1 After the analysis of 30 samples of a given matrix type (water, soil, sludge, pulp, etc.) for which the labeled compounds pass the tests in Section 9.3, compute the average percent recovery (R) and the standard deviation of the percent recovery (S_R) for the labeled compounds only. Express the assessment as a percent recovery interval from $R - 2S_R$ to $R + 2S_R$ for each matrix. For example, if R =

90% and S_R = 10% for five analyses of pulp, the recovery interval is expressed as 70 to 110%.

9.4.2 Update the accuracy assessment for each labeled compound in each matrix on a regular basis (e.g., after each five to ten new measurements).

9.5 Method blanks—A reference matrix Method blank is analyzed with each sample batch (Section 4.3) to demonstrate freedom from contamination. The matrix for the Method blank must be similar to the sample matrix for the batch, e.g., a 1-L reagent water blank (Section 7.6.1), high-solids reference matrix blank (Section 7.6.2), paper matrix blank (Section 7.6.3); tissue blank (Section 7.6.4), or alternative reference matrix blank (Section 7.6.5).

9.5.1 Spike 1.0 mL each of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12), and the Labeled cleanup standard spiking solution (Section 7.13) into the Method blank, according to the procedures in Sections 11 through 18. Prepare, extract, clean up, and concentrate the Method blank. Analyze the blank immediately after analysis of the OPR (Section 15.5) to demonstrate freedom from contamination.

9.5.2 If any CB (Table 1) is found in the blank at greater than the minimum level (Table 2) or one-third the regulatory compliance limit, whichever is greater; or if any potentially interfering compound is found in the blank at the minimum level for each CB given in Table 2 (assuming a response factor of 1 relative to the quantitation reference in Table 2 at that level of chlorination for a potentially interfering compound; i.e., a compound not listed in this Method), analysis of samples must be halted until the sample batch is re-extracted and the extracts re-analyzed, and the blank associated with the sample batch shows no evidence of contamination at these levels. All samples must be associated with an uncontaminated Method blank before the results for those samples may be reported or used for permitting or regulatory compliance purposes.

9.6 QC Check Sample—Analyze the QC Check Sample (Section 7.15) periodically to assure the accuracy of calibration standards and the overall reliability of the analytical process. It is suggested that the QC Check Sample be analyzed at least quarterly.

9.7 The specifications contained in this Method can be met if the apparatus used is calibrated properly and then maintained in a calibrated state. The standards used for calibration (Section 10), calibration verification (Section 15.3), and for initial (Section 9.2) and ongoing (Section 15.5) precision and recovery should be identical, so that the most precise results will be obtained. A GC/MS instrument will provide the most reproducible results if dedicated to the settings and conditions required for determination of CBs by this Method.

9.8 Depending on specific program requirements, field replicates may be collected to determine the precision of the sampling technique, and spiked samples may be required to determine the accuracy of the analysis when the internal standard method is used.

10.0 Calibration

10.1 Establish the operating conditions necessary to meet the retention times (RTs) and relative retention times (RRTs) for the CBs in Table 2.

10.1.1 Suggested GC operating conditions:

Injector temperature:	270 °C
Interface temperature:	290 °C
Initial temperature:	75 °C
Initial time:	2 minutes
Temperature program:	75-150 °C @ 15 °C/minute
	150-290 °C @ 2.5 °C/minute
Final time:	1 minute

Note: *All portions of the column that connect the GC to the ion source should remain at or above the interface temperature specified above during analysis to preclude condensation of less volatile compounds.*

The GC conditions may be optimized for compound separation and sensitivity. Once optimized, the same GC conditions must be used for the analysis of all standards, blanks, IPR and OPR standards, and samples.

10.1.2 Retention time calibration for the CB congeners

10.1.2.1 Separately inject each of the diluted individual congener solutions (Section 7.10.2.1.2). Establish the beginning and ending retention times for the scan descriptors in Table 7. Scan descriptors other than those listed in Table 7 may be used provided the MLs in Table 2 are met. Store the retention time (RT) and relative retention time (RRT) for each congener in the data system.

10.1.2.2 The absolute retention time of CB 209 must exceed 55 minutes on the SPB-octyl column; otherwise, the GC temperature program must be adjusted and this test repeated until the minimum retention time criterion is met. If a GC column or column system alternate to the SPB-octyl column is used, a similar minimum retention time specification must be established for the alternate column or column systems so that interferences that may be encountered in environmental samples will be resolved from the analytes of interest.

This specification is deemed to be met if the retention time of CB 209 is greater than 55 minutes on such alternate column.

10.1.2.3 Inject the Diluted combined 209 congener solution (Section 7.10.2.2 and Table 5). Adjust the chromatographic conditions and scan descriptors until the RT and RRT for all congeners are within the windows in Table 2 and the column performance specifications in Sections 6.9.1 - 6.9.1.2 are met. If an alternate column is used, adjust the conditions for that column. If column performance is unacceptable, optimize the analysis conditions or replace the column and repeat the performance tests. Confirm that the scan descriptor changes at times when CBs do not elute.

10.1.2.4 After the column performance tests are passed (Section 10.1.2.2 - 10.1.2.3), store the RT and RRT for the resolved congeners and the RT and RRT for the isomeric congeners that co-elute.

10.2 Mass spectrometer (MS) resolution

10.2.1 Using PFK (or other reference substance) and a molecular leak, tune the instrument to meet the minimum required resolving power of 10,000 (10% valley) at m/z 330.9792 or any other significant PFK fragment in the range of 300 to 350. For each descriptor (Table 7), monitor and record the resolution and exact m/z's of three to five reference peaks covering the mass range of the descriptor. The level of PFK (or other reference substance) metered into the HRMS during analyses should be adjusted so that the amplitude of the most intense selected lock-mass m/z signal (regardless of the descriptor number) does not exceed 10% of the full-scale deflection for a given set of detector parameters. Under those conditions, sensitivity changes that might occur during the analysis can be more effectively monitored.

Note: *Different lots and types of PFK can contain varying levels of contamination, and excessive PFK (or other reference substance) may cause noise problems and contamination of the ion source necessitating increased frequency of source cleaning.*

10.2.2 The analysis time for CBs may exceed the long-term mass stability of the mass spectrometer. Because the instrument is operated in the high-resolution mode, mass drifts of a few ppm (e.g., 5 ppm in mass) can have serious adverse effects on instrument performance. Therefore, mass-drift correction is mandatory and a lock-mass m/z from perfluorokerosene (PFK) or other reference substance is used for drift correction. The lock-mass m/z is dependent on the exact m/z's monitored within each descriptor, as shown in Table 7. The deviation between the exact m/z and the theoretical m/z (Table 7) for each exact m/z monitored must be less than 5 ppm.

10.2.3 Obtain a selected ion current profile (SICP) at the two exact m/z's specified in Table 7 and at ≥10,000 resolving power at each LOC for the native congeners and congener groups and for the labeled congeners. Because of the extensive mass range covered in each function, it may not be possible to maintain 10,000 resolution throughout the mass range during the function. Therefore, resolution must be ≥8,000 throughout the mass range and must be ≥10,000 in the center of the mass range for each function.

10.2.4 If the HRMS has the capability to monitor resolution during the analysis, it is acceptable to terminate the analysis when the resolution falls below the minimum (Section 10.2.1.3) to save re-analysis time.

10.3 Ion abundance ratios, minimum levels, and signal-to-noise ratios. Choose an injection volume of either 1 or 2 μL, consistent with the capability of the HRGC/HRMS instrument. Inject a 1 or 2 μL aliquot of the CS-1 calibration solution (Table 5) using the GC conditions in Section 10.1.1.

10.3.1 Measure the SICP areas for each congener or congener group, and compute the ion abundance ratios at the exact m/z's specified in Table 7. Compare the computed ratio to the theoretical ratio given in Table 8.

10.3.1.1 The exact m/z's to be monitored in each descriptor are shown in Table 7. Each group or descriptor must be monitored in succession as a function of GC retention time to ensure that the CBs of interest are detected. Additional m/z's may be monitored in each descriptor, and the m/z's may be divided among more than the descriptors listed in Table 7, provided that the laboratory is able to monitor the m/z's of all CBs that may elute from the GC in a given LOC window. The laboratory must also monitor exact m/z's for congeners at higher levels of chlorination to determine if fragments will compromise measurement of congeners at lower levels of chlorination.

10.3.1.2 The mass spectrometer must be operated in a mass-drift correction mode, using PFK (or other reference substance) to provide lock m/z's. The lock mass for each group of m/z's is shown in Table 7. Each lock mass must be monitored and must not vary by more than ±20% throughout its respective retention time window. Variations of lock mass by more than 20% indicate the presence of co-eluting interferences that raise the source pressure and may significantly reduce the sensitivity of the mass spectrometer. Re-injection of another aliquot of the sample extract may not resolve the problem and additional cleanup of the extract may be required to remove the interference. A lock mass interference or suppression in a retention time region in which CBs and labeled compounds do not elute may be ignored.

10.3.2 All CBs and labeled compounds in the CS-1 standard must be within the QC limits in Table 8 for their respective ion abundance ratios; otherwise, the mass spectrometer must be adjusted and this test repeated until the m/z ratios fall within the limits specified. If the adjustment alters the resolution of the mass spectrometer, resolution must be verified (Section 10.2.1) prior to repeat of the test.

10.3.3 Verify that the HRGC/HRMS instrument meets the estimated minimum levels (EMLs) in Table 2. The peaks representing the CBs and labeled compounds in the CS-1 calibration standard must have signal-to-noise ratios (S/N) $\geq$ 10; otherwise, the mass spectrometer must be adjusted and this test repeated until the minimum levels in Table 2 are met.

Note: *The EMDLs and EMLs in Table 2 are based on the levels of contamination normally found in laboratories. Lower levels may be readily achievable if segregation and extensive cleaning of glassware is employed. If lower levels are achievable, these levels must be established as described in Section 17.6.1.4.1.*

10.4 Calibration by isotope dilution—Isotope dilution is used for calibration of the Toxics/LOC CBs. The reference compound for each native compound its labeled analog, as listed in Table 2. A 5- or 6-point calilbration encompassing the concentration range is prepared for each native congener.

10.4.1 For the Toxics/LOC CBs determined by isotope dilution, the relative response (RR) (labeled to native) vs. concentration in the calibration solutions (Table 5) is computed over the calibration range according to the procedures described below. Five calibration points are employed for less-sensitive HRMS instruments (e.g., VG 70); five or six points may be employed for more-sensitive instruments (e.g., Micromass Autospec Ultima).

10.4.2 The response of each Toxics/LOC CB relative to its labeled analog is determined using the area responses of both the primary and secondary exact m/z's specified in Table 7, for each calibration standard, as follows:

$$RR = \frac{(A1_n + A2_n)\, C_l}{(A1_l + A2_l)\, C_n}$$

Where:

$A1_n$ *and* $A2_n$ = *The areas of the primary and secondary m/z's for the PCB.*

$A1_l$ *and* $A2_l$ = *The areas of the primary and secondary m/z's for the labeled compound.*

C_l = *The concentration of the labeled compound in the calibration standard (Table 5).*

C_n = *The concentration of the native compound in the calibration standard (Table 5).*

10.4.3 To calibrate the analytical system by isotope dilution, inject calibration standards CS-1 through CS-5 (Section 7.10 and Table 5) for a less sensitive instrument or CS-0.2 through CS-5 for a more sensitive instrument. Use a volume identical to the volume chosen in Section 10.3, the procedure in Section 14, and the conditions in Section 10.1.1. Compute and store the relative response (RR) for each Native Toxics/LOC CB at each concentration. Compute the average (mean) RR and the RSD of the 5 (or 6) RRs.

10.4.4 Linearity—If the RR for any Native Toxics/LOC CB is constant (less than 20% RSD), the average RR may be used for that congener; otherwise, the complete calibration curve for that congener must be used over the calibration range.

10.5 Calibration by internal standard—Internal standard calibration is applied to determination of the native CBs for which a labeled compound is not available, to determination of the Labeled Toxics/LOC/window-defining congeners and Labeled cleanup congeners for performance tests and intra-laboratory statistics (Sections 9.4 and 15.5.4), and to determination of the Labeled injection internal standards except for CB 178. The reference compound for each compound is listed in Table 2. For the native congeners (other than the Native Toxics/LOC CBs), calibration is performed at a single point using the CS-3 (VER) standard. For the labeled compounds, calibration is performed using data from the 5 (or 6) points in the calibration for the Native Toxics/LOC CBs (Section 10.4).

10.5.1 Response factors—Internal standard calibration requires the determination of response factors (RF) defined by the following equation:

$$RF = \frac{(A1_s + A2_s)\ C_{is}}{(A1_{is} + A2_{is})\ C_s}$$

Where:

$A1_s$ *and* $A2_s$ = *The areas of the primary and secondary m/z's for the PCB.*

$A1_{is}$ *and* $A2_{is}$ = *The areas of the primary and secondary m/z's for the internal standard.*

C_{is} = *The concentration of the internal standard (Table 5).*

C_s = *The concentration of the compound in the calibration standard (Table 5).*

10.5.2 To single-concentration calibrate the analytical system for native CBs other than the Native Toxics/LOC CBs by internal standard, inject the Diluted combined 209 congener solution (Section 7.10.2.2 and Table 3). Use a volume identical to the volume chosen in Section 10.3, the procedure in Section 14, and the conditions in Section 10.1.1.

10.5.3 Compute and store the response factor (RF) for all native CBs except the Native Toxics/LOC CBs. Use the average (mean) response of the labeled compounds at each level of chlorination (LOC) as the quantitation reference, as shown in Table 2. For the combinations of isomeric congeners that co-elute, compute a

combined RF for the co-eluted group. For example, for congener 122, the areas at the two exact m/z's for 104L, 105L, 114L, 123L, 118L, and 126L are summed and the total area is divided by 6 (because there are 6 congeners in the quantitation reference).

Note: *All labeled congeners at each LOC are used as reference to reduce the effect of an interference if a single congener is used as reference. Other quantitation references and procedures may be used provided that the results produced are as accurate as results produced by the quantitation references and procedures described in this Section.*

10.5.4 Compute and store the response factor (RF) for the labeled compounds, except CB 178. For the Labeled Toxics/LOC/window-defining compounds and the Labeled cleanup standards, use the nearest eluted Labeled injection internal standard as the quantitation reference, as given in Table 2. The Labeled injection internal standards are referenced to CB 178, as shown in Table 2.

11.0 Sample preparation

11.1 Sample preparation involves modifying the physical form of the sample so that the CBs can be extracted efficiently. In general, the samples must be in a liquid form or in the form of finely divided solids in order for efficient extraction to take place. Table 9 lists the phases and suggested quantities for extraction of various sample matrices.

For samples known or expected to contain high levels of the CBs, the smallest sample size representative of the entire sample should be used (see Section 18). For all samples, the blank and IPR/OPR aliquots must be processed through the same steps as the sample to check for contamination and losses in the preparation processes.

11.1.1 For samples that contain particles, percent solids and particle size are determined using the procedures in Sections 11.2 and 11.3, respectively.

11.1.2 Aqueous samples—Because CBs may be bound to suspended particles, the preparation of aqueous samples is dependent on the solids content of the sample.

11.1.2.1 Aqueous samples containing one percent solids or less are prepared per Section 11.4 and extracted directly using one of the extraction techniques in Section 12.2.

11.1.2.2 For aqueous samples containing greater than one percent solids, a sample aliquot sufficient to provide 10 g of dry solids is used, as described in Section 11.5.

11.1.3 Solid samples are prepared using the procedure described in Section 11.5 followed by extraction using the SDS procedure in Section 12.3.

11.1.4 Multi-phase samples—The phase(s) containing the CBs is separated from the non-CB phase using pressure filtration and centrifugation, as described in Section 11.6. The CBs will be in the organic phase in a multi-phase sample in which an organic phase exists.

11.1.5 Procedures for grinding, homogenization, and blending of various sample phases are given in Section 11.7.

11.1.6 Tissue samples—Preparation procedures for fish and other tissues are given in Section 11.8.

11.2 Determination of percent suspended solids.

Note: *This aliquot is used for determining the solids content of the sample, not for determination of CBs.*

11.2.1 Aqueous liquids and multi-phase samples consisting of mainly an aqueous phase.

11.2.1.1 Desiccate and weigh a GF/D filter (Section 6.5.3) to three significant figures.

11.2.1.2 Filter 10.0 ± 0.02 mL of well-mixed sample through the filter.

11.2.1.3 Dry the filter a minimum of 12 hours at 110 ± 5 °C and cool in a desiccator.

11.2.1.4 Calculate percent solids as follows:

$$\%\ solids = \frac{weight\ of\ sample\ aliquot\ after\ drying\ (g) - weight\ of\ filter\ (g)}{10\ g} \times 100$$

11.2.2 Non-aqueous liquids, solids, semi-solid samples, and multi-phase samples in which the main phase is not aqueous; but not tissues.

11.2.2.1 Weigh 5 to 10 g of sample to three significant figures in a tared beaker.

11.2.2.2 Dry a minimum of 12 hours at 110 ± 5 °C, and cool in a desiccator.

11.2.2.3 Calculate percent solids as follows:

$$\%\ solids = \frac{weight\ of\ sample\ aliquot\ after\ drying}{weight\ of\ sample\ aliquot\ before\ drying} \times 100$$

11.3 Estimation of particle size.

11.3.1 Spread the dried sample from Section 11.2.2.2 on a piece of filter paper or aluminum foil in a fume hood or glove box.

11.3.2 Estimate the size of the particles in the sample. If the size of the largest particles is greater than 1 mm, the particle size must be reduced to 1 mm or less prior to extraction using the procedures in Section 11.7.

11.4 Preparation of aqueous samples containing one percent suspended solids or less.

11.4.1 Aqueous samples containing one percent suspended solids or less are prepared using the procedure below and extracted using the one of the extraction techniques in Section 12.2.

11.4.2 Preparation of sample and QC aliquots.

11.4.2.1 Mark the original level of the sample on the sample bottle for reference. Weigh the sample plus bottle to ±1 g.

11.4.2.2 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into the sample bottle. Cap the bottle and mix the sample by careful shaking. Allow the sample to equilibrate for 1 to 2 hours, with occasional shaking.

11.4.2.3 For each sample or sample batch (to a maximum of 20 samples) to be extracted during the same 12-hour shift, place two 1.0-L aliquots of reagent water in clean sample bottles or flasks.

11.4.2.4 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into both reagent water aliquots. One of these aliquots will serve as the Method blank.

11.4.2.5 Spike 1.0 mL of the Native Toxics/LOC standard spiking solution (Section 7.11) into the remaining reagent water aliquot. This aliquot will serve as the OPR (Section 15.5).

11.4.2.6 For extraction using SPE, add 5 mL of methanol to the sample and QC aliquots. Cap and shake the sample and QC aliquots to mix thoroughly, and proceed to Section 12.2 for extraction.

11.5 Preparation of samples containing greater than one percent solids.

11.5.1 Weigh a well-mixed aliquot of each sample (of the same matrix type) sufficient to provide 10 g of dry solids (based on the solids determination in Section 11.2) into a clean beaker or glass jar.

11.5.2 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into the sample.

11.5.3 For each sample or sample batch (to a maximum of 20 samples) to be extracted during the same 12 hour shift, weigh two 10-g aliquots of the appropriate reference matrix (Section 7.6) into clean beakers or glass jars.

11.5.4 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into both reference matrix aliquots. Spike 1.0 mL of the Native Toxics/LOC standard spiking solution (Section 7.11) into one reference matrix aliquot. This aliquot will serve as the OPR (Section 15.5). The other aliquot will serve as the Method blank.

11.5.5 Stir or tumble and equilibrate the aliquots for 1 to 2 hours.

11.5.6 Decant excess water. If necessary to remove water, filter the sample through a glass-fiber filter and discard the aqueous liquid.

11.5.7 If particles >1 mm are present in the sample (as determined in Section 11.3.2), spread the sample on clean aluminum foil in a hood. After the sample is dry, grind to reduce the particle size (Section 11.7).

11.5.8 Extract the sample and QC aliquots using the SDS procedure in Section 12.3.

11.6 Multi-phase samples.

11.6.1 Using the percent solids determined in Section 11.2.1 or 11.2.2, determine the volume of sample that will provide 10 g of solids, up to 1 L of sample.

11.6.2 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into the amount of sample determined in Section 11.6.1, and into the OPR and blank. Spike 1.0 mL of the Native Toxics/LOC standard spiking solution (Section 7.11) into the OPR. Pressure filter the sample, blank, and OPR through Whatman GF/D glass-fiber filter paper (Section 6.5.3). If necessary to separate the phases and/or settle the solids, centrifuge these aliquots prior to filtration.

11.6.3 Discard any aqueous phase (if present). Remove any non-aqueous liquid present and reserve the maximum amount filtered from the sample (Section 11.6.1) or 10 g, whichever is less, for combination with the solid phase (Section 12.3.5).

11.6.4 If particles >1 mm are present in the sample (as determined in Section 11.3.2) and the sample is capable of being dried, spread the sample and QC aliquots on clean aluminum foil in a hood. Observe the precaution in Section 4.8.

11.6.5 After the aliquots are dry or if the sample cannot be dried, reduce the particle size using the procedures in Section 11.7 and extract the reduced-size particles using the SDS procedure in Section 12.3. If particles >1 mm are not present, extract the particles and filter in the sample and QC aliquots directly using the SDS procedure in Section 12.3.

11.7 Sample grinding, homogenization, or blending—Samples with particle sizes greater than 1 mm (as determined in Section 11.3.2) are subjected to grinding, homogenization, or blending. The method of reducing particle size to less than 1 mm is matrix-dependent. In general, hard particles can be reduced by grinding with a mortar and pestle. Softer particles can be reduced by grinding in a Wiley mill or meat grinder, by homogenization, or in a blender.

11.7.1 Each size-reducing preparation procedure on each matrix must be verified by running the tests in Section 9.2 before the procedure is employed routinely.

11.7.2 The grinding, homogenization, or blending procedures must be carried out in a glove box or fume hood to prevent particles from contaminating the work environment.

11.7.3 Grinding—Certain papers and pulps, slurries, and amorphous solids can be ground in a Wiley mill or heavy duty meat grinder. In some cases, reducing the temperature of the sample to freezing or to dry ice or liquid nitrogen temperatures can aid in the grinding process. Grind the sample aliquots from Sections 11.5.7 or 11.6.5 in a clean grinder. Do not allow the sample temperature to exceed 50 °C. Grind the blank and reference matrix aliquots using a clean grinder.

11.7.4 Homogenization or blending—Particles that are not ground effectively, or particles greater than 1 mm in size after grinding, can often be reduced in size by high speed homogenization or blending. Homogenize and/or blend the particles or filter from Sections 11.5.7 or 11.6.5 for the sample, blank, and OPR aliquots.

11.7.5 Extract the aliquots using the SDS procedure in Section 12.3.

11.8 Fish and other tissues—Prior to processing tissue samples, the laboratory must determine the exact tissue to be analyzed. Common requests for analysis of fish tissue include whole fish-skin on, whole fish-skin removed, edible fish fillets (filleted in the field or by the laboratory), specific organs, and other portions. Once the appropriate tissue has been determined, the sample must be homogenized.

11.8.1 Homogenization

11.8.1.1 Samples are homogenized while still frozen, where practical. If the laboratory must dissect the whole fish to obtain the appropriate tissue for analysis, the unused tissues may be rapidly refrozen and stored in a clean glass jar for subsequent use.

11.8.1.2 Each analysis requires 10 g of tissue (wet weight). Therefore, the laboratory should homogenize at least 20 g of tissue to allow for re-extraction of a second aliquot of the same homogenized sample, if re-analysis is required. When whole fish analysis is necessary, the entire fish is homogenized.

11.8.1.3 Homogenize the sample in a tissue homogenizer (Section 6.3.3) or grind in a meat grinder (Section 6.3.4). Cut tissue too large to feed into the grinder into smaller pieces. To assure homogeneity, grind three times.

11.8.1.4 Transfer approximately 10 g (wet weight) of homogenized tissue to a clean, tared, 400- to 500-mL beaker.

11.8.1.5 Transfer the remaining homogenized tissue to a clean jar with a fluoropolymer-lined lid. Seal the jar and store the tissue at <-10 °C. Return any tissue that was not homogenized to its original container and store at <-10 °C.

11.8.2 QC aliquots

11.8.2.1 Prepare a Method blank by adding approximately 1-2 g of the oily liquid reference matrix (Section 7.6.4) to a 400- to 500-mL beaker.

11.8.2.2 Prepare a precision and recovery aliquot by adding 1-2 g of the oily liquid reference matrix (Section 7.6.4) to a separate 400- to 500-mL beaker. Record the weight to the nearest 10 mg. If the initial precision and recovery test is to be performed, use four aliquots; if the ongoing precision and recovery test is to be performed, use a single aliquot.

11.8.3 Spiking

11.8.3.1 Spike 1.0 mL of the Labeled Toxics/LOC/window-defining standard spiking solution (Section 7.12) into the sample, blank, and OPR aliquot.

11.8.3.2 Spike 1.0 mL of the Native Toxics/LOC standard spiking solution (Section 7.11) into the OPR aliquot.

11.8.4 Extract the aliquots using the procedures in Section 12.4.

12.0 Extraction and concentration

12.1 Extraction procedures include solid phase (Section 12.2.1), separatory funnel (Section 12.2.2), and continuous liquid/liquid (Section 12.2.3) for aqueous liquids; Soxhlet/Dean-Stark (Section 12.3) for solids and filters; and Soxhlet extraction (Section 12.4) for tissues. Acid/base back-extraction (Section 12.5) is used for initial cleanup of extracts.

Macro-concentration procedures include rotary evaporation (Section 12.6.1), heating mantle (Section 12.6.2), and Kuderna-Danish (K-D) evaporation (Section 12.6.3). Micro-concentration uses nitrogen blowdown (Section 12.7).

12.2 Extraction of aqueous liquids

12.2.1 SPE of samples containing less than one percent solids.

12.2.1.1 Disk preparation

12.2.1.1.1 Remove the test tube from the suction flask (Figure 4). Place an SPE disk on the base of the filter holder and wet with methylene chloride. While holding a GMF 150 filter above the SPE disk with tweezers, wet the filter with methylene chloride and lay the filter on the SPE disk, making sure that air is not trapped between the filter and disk. Clamp the filter and SPE disk between the 1-L glass reservoir and the vacuum filtration flask.

12.2.1.1.2 Rinse the sides of the reservoir with approx 15 mL of methylene chloride using a squeeze bottle or pipet. Apply vacuum momentarily until a few drops appear at the drip tip. Release the vacuum and allow the filter/disk to soak for approx one minute. Apply vacuum and draw all of the methylene chloride through the filter/disk. Repeat the wash step with approx 15 mL of acetone and allow the filter/disk to air dry.

12.2.1.2 Sample extraction.

12.2.1.2.1 Pre-wet the disk by adding approx 20 mL of methanol to the reservoir. Pull most of the methanol through the filter/disk, retaining a layer of methanol approx 2 mm

thick on the filter. Do not allow the filter/disk to go dry from this point until the extraction is completed.

12.2.1.2.2 Add approx 20 mL of reagent water to the reservoir and pull most through, leaving a layer approx 2 mm thick on the filter/disk.

12.2.1.2.3 Allow the sample (Section 11.4.2.6) to stand for 1-2 hours, if necessary, to settle the suspended particles. Decant the clear layer of the sample, the blank (Section 11.4.2.4), or IPR/OPR aliquot (Section 11.4.2.5) into its respective reservoir and turn on the vacuum to begin the extraction. Adjust the vacuum to complete the extraction in no less than 10 minutes. For samples containing a high concentration of particles (suspended solids), the extraction time may be an hour or longer.

12.2.1.2.4 Before all of the sample has been pulled through the filter/disk, add approx 50 mL of reagent water to the sample bottle, swirl to suspend the solids (if present), and pour into the reservoir. Pull through the filter/disk. Use additional reagent water rinses until all solids are removed.

12.2.1.2.5 Before all of the sample and rinses have been pulled through the filter/disk, rinse the sides of the reservoir with small portions of reagent water.

12.2.1.2.6 Partially dry the filter/disk under vacuum for approx 3 minutes.

12.2.1.3 Elution of the filter/disk.

12.2.1.3.1 Release the vacuum, remove the entire filter/disk/reservoir assembly from the vacuum flask, and empty the flask. Insert a test tube for eluant collection into the flask. The test tube should have sufficient capacity to contain the total volume of the elution solvent (approx 50 mL) and should fit around the drip tip. The drip tip should protrude into the test tube to preclude loss of sample from spattering when vacuum is applied. Reassemble the filter/disk/reservoir assembly on the vacuum flask.

12.2.1.3.2 Wet the filter/disk with 4-5 mL of acetone. Allow the acetone to spread evenly across the disk and soak for 15-20 seconds. Pull the acetone through the disk, releasing the vacuum when approx 1 mm thickness remains on the filter.

12.2.1.3.3 Rinse the sample bottle with approx 20 mL of methylene chloride and transfer to the reservoir. Pull approx half of the solvent through the filter/disk and release the vacuum. Allow the filter/disk to soak for approx 1 minute. Pull all of the solvent through the disk. Repeat the bottle rinsing and elution step with another 20 mL of methylene chloride. Pull all of the solvent through the disk.

12.2.1.3.4 Release the vacuum, remove the filter/disk/reservoir assembly, and remove the test tube containing the sample solution. Quantitatively transfer the solution to a 250-mL separatory funnel and proceed to Section 12.5 for back-extraction.

12.2.2 Separatory funnel extraction

12.2.2.1 Pour the spiked sample (Section 11.4.2.2) into a 2-L separatory funnel. Rinse the bottle or flask twice with 5 mL of reagent water and add these rinses to the separatory funnel.

12.2.2.2 Add 60 mL methylene chloride to the empty sample bottle. Seal the bottle and shake 60 seconds to rinse the inner surface. Transfer the solvent to the separatory funnel, and extract the sample by shaking the funnel for 2 minutes with periodic venting. Allow the organic layer to separate from the aqueous phase for a minimum of 10 minutes. If an emulsion forms and is more than one-third the volume of the solvent layer, employ mechanical techniques to complete the phase separation (see note below). Drain the methylene chloride extract through a solvent-rinsed glass funnel approximately one-half full of granular anhydrous sodium sulfate (Section 7.2.1) supported on clean glass-fiber paper into a solvent-rinsed concentration device (Section 12.6).

Note: *If an emulsion forms, the laboratory must employ mechanical techniques to complete the phase separation. The optimum technique depends upon the sample, but may include stirring, filtration through glass wool, use of phase separation paper, centrifugation, use of an ultrasonic bath with ice, addition of NaCl, or other physical methods. Alternatively, solid-phase (Section 12.2.1), CLLE (Section 12.2.3), or other extraction techniques may be used to prevent emulsion formation. Any alternative technique is acceptable so long as the requirements in Section 9.2 are met.*

12.2.2.3 Extract the water sample two more times with 60-mL portions of methylene chloride. Drain each portion through the sodium sulfate into the concentrator. After the third extraction, rinse the separatory funnel with at least 20 mL of methylene chloride, and drain this rinse through the sodium sulfate into the concentrator. Repeat this rinse at least twice. Set aside the funnel with sodium sulfate if the extract is to be combined with the extract from the particles.

12.2.2.4 Concentrate the extract using one of the macro-concentration procedures in Section 12.6 and proceed to back extraction in Section 12.5.

12.2.3 Continuous liquid/liquid extraction

12.2.3.1 Place 100-150 mL methylene chloride in each continuous extractor and 200-300 mL in each distilling flask.

12.2.3.2 Pour the sample(s), blank, and QC aliquots into the extractors. Rinse the sample containers with 50-100 mL methylene chloride and add to the respective extractors. Include all solids in the extraction process.

12.2.3.3 Begin the extraction by heating the flask until the methylene chloride is boiling. When properly adjusted, 1-2 drops of methylene chloride per second will fall from the condenser tip into the water. Extract for 16-24 hours.

12.2.3.4 Remove the distilling flask, estimate and record the volume of extract (to the nearest 100 mL), and pour the contents through a drying column containing 7 to 10 cm of granular anhydrous sodium sulfate into a 500-mL K-D evaporator flask equipped with a 10-mL concentrator tube. Rinse the distilling flask with 30-50 mL of methylene chloride and pour through the drying column. Concentrate and exchange to hexane per Section 12.6 and back extract per Section 12.5.

12.3 SDS extraction of samples containing particles.

12.3.1 Charge a clean extraction thimble (Section 6.4.2.2) with 5.0 g of 100/200 mesh silica (Section 7.5.1.1) topped with 100 g of quartz sand (Section 7.3.2).

Note: *Do not disturb the silica layer throughout the extraction process.*

12.3.2 Place the thimble in a clean extractor. Place 30 to 40 mL of toluene in the receiver and 200 to 250 mL of toluene in the flask.

12.3.3 Pre-extract the glassware by heating the flask until the toluene is boiling. When properly adjusted, 1 to 2 drops of toluene will fall per second from the condenser tip into the receiver. Extract the apparatus for a minimum of 3 hours.

12.3.4 After pre-extraction, cool and disassemble the apparatus. Rinse the thimble with toluene and allow to air dry.

12.3.5 Load the wet sample and/or filter from Sections 11.5.8, 11.6.5, or 11.7.5 and any nonaqueous liquid from Section 11.6.3 into the thimble and manually mix into the sand layer with a clean metal spatula, carefully breaking up any large lumps of sample.

12.3.6 Reassemble the pre-extracted SDS apparatus, and add a fresh charge of toluene to the receiver and reflux flask. Apply power to the heating mantle to begin refluxing. Adjust the reflux rate to match the rate of percolation through the sand and silica beds until water removal lessens the restriction to toluene flow. Frequently check the apparatus for foaming during the first 2 hours of extraction. If foaming occurs, reduce the reflux rate until foaming subsides.

12.3.7 Drain the water from the receiver at 1-2 hours and 8-9 hours, or sooner if the receiver fills with water. Reflux the sample for a total of 16-24 hours. Cool and disassemble the apparatus. Record the total volume of water collected.

12.3.8 Remove the distilling flask. Drain the water from the Dean-Stark receiver and add any toluene in the receiver to the extract in the flask.

12.3.9 Concentrate the extracts from particles to approximately 10 mL using the rotary evaporator (Section 12.6.1) or heating mantle (Section 12.6.2), transfer to a 250-mL separatory funnel, and proceed with back-extraction (Section 12.5).

12.4 Soxhlet extraction of tissue

12.4.1 Add 30 to 40 g of powdered anhydrous sodium sulfate (Section 7.2.2) to each of the beakers (Section 11.8.4) and mix thoroughly. Cover the beakers with

aluminum foil and allow to equilibrate for 12-24 hours. Remix prior to extraction to prevent clumping.

12.4.2 Assemble and pre-extract the Soxhlet apparatus per Sections 12.3.1-12.3.4, except use the methylene chloride:hexane (1:1) mixture for the pre-extraction and rinsing and omit the quartz sand.

12.4.3 Reassemble the pre-extracted Soxhlet apparatus and add a fresh charge of methylene chloride:hexane to the reflux flask.

12.4.4 Transfer the sample/sodium sulfate mixture (Section 12.4.1) to the Soxhlet thimble, and install the thimble in the Soxhlet apparatus.

12.4.5 Rinse the beaker with several portions of solvent mixture and add to the thimble. Fill the thimble/receiver with solvent. Extract for 18-24 hours.

12.4.6 After extraction, cool and disassemble the apparatus.

12.4.7 Quantitatively transfer the extract to a macro-concentration device (Section 12.6), and concentrate to near dryness. Set aside the concentration apparatus for re-use.

12.4.8 Complete the removal of the solvent using the nitrogen blowdown procedure (Section 12.7) and a water bath temperature of 60 °C. Weigh the receiver, record the weight, and return the receiver to the blowdown apparatus, concentrating the residue until a constant weight is obtained.

12.4.9 Percent lipid determination—The lipid content is determined by extraction of tissue with the same solvent system (methylene chloride:hexane) that was used in EPA's National Dioxin Study (Reference 16) so that lipid contents are consistent with that study.

12.4.9.1 Redissolve the residue in the receiver in hexane and spike 1.0 mL of the Labeled cleanup standard spiking solution (Section 7.13) into the solution.

12.4.9.2 Transfer the residue/hexane to the anthropogenic isolation column (Section 13.6), retaining the boiling chips in the concentration apparatus. Use several rinses to assure that all material is transferred. If necessary, sonicate or heat the receiver slightly to assure that all material is re-dissolved. Allow the receiver to dry. Weigh the receiver and boiling chips.

12.4.9.3 Calculate the lipid content to the nearest three significant figures as follows:

$$Percent\ lipid = \frac{Weight\ of\ residue\ (g)}{Weight\ of\ tissue\ (g)} \times 100$$

12.4.9.4 The laboratory should determine the lipid content of the blank, IPR, and OPR to assure that the extraction system is working effectively.

12.5 Back-extraction with base and acid.

12.5.1 Back-extraction may not be necessary for some samples. For some samples, the presence of color in the extract may indicate that back-extraction is necessary. If back-extraction is not performed, spike 1.0 mL of the Labeled cleanup standard spiking solution (Section 7.13) into the extract and concentrate the extract for cleanup or analysis (Section 12.7). If back-extraction is necessary, spike 1.0 mL of the Labeled cleanup standard spiking solution (Section 7.13) into the separatory funnels containing the sample and QC extracts from Section 12.2.3.4 or 12.3.9.

12.5.2 Partition the extract against 50 mL of potassium hydroxide solution (Section 7.1.1). Shake for 2 minutes with periodic venting into a hood. Remove and discard the aqueous layer. Repeat the base washing until no color is visible in the aqueous layer, to a maximum of four washings. Minimize contact time between the extract and the base to prevent degradation of the CBs. Stronger potassium hydroxide solutions may be employed for back-extraction, provided that the laboratory meets the specifications for labeled compound recovery and demonstrates acceptable performance using the procedure in Section 9.2.

12.5.3 Partition the extract against 50 mL of sodium chloride solution (Section 7.1.4) in the same way as with base. Discard the aqueous layer.

12.5.4 Partition the extract against 50 mL of sulfuric acid (Section 7.1.2) in the same way as with base. Repeat the acid washing until no color is visible in the aqueous layer, to a maximum of four washings.

12.5.5 Repeat the partitioning against sodium chloride solution and discard the aqueous layer.

12.5.6 Pour each extract through a drying column containing 7 to 10 cm of granular anhydrous sodium sulfate (Section 7.2.1). Rinse the separatory funnel with 30 to 50 mL of solvent, and pour through the drying column. Collect each extract in a round-bottom flask. Re-concentrate the sample and QC aliquots per Sections 12.6-12.7, and clean up the samples and QC aliquots per Section 13.

12.6 Macro-concentration—Extracts in toluene are concentrated using a rotary evaporator or a heating mantle; extracts in methylene chloride or hexane are concentrated using a rotary evaporator, heating mantle, or Kuderna-Danish apparatus.

Note: *In the concentration procedures below, the extract must not be allowed to concentrate to dryness because the mono- through tri-chlorobiphenyls may be totally or partially lost.*

12.6.1 Rotary evaporation—Concentrate the extracts in separate round-bottom flasks.

12.6.1.1 Assemble the rotary evaporator according to manufacturer's instructions, and warm the water bath to 45 °C. On a daily basis, pre-clean the rotary evaporator by concentrating 100 mL of clean extraction solvent through the system. Archive both the concentrated solvent and the solvent in the catch flask for a contamination check if necessary. Between samples, three 2- to 3-mL aliquots of solvent should be rinsed down the feed tube into a waste beaker.

12.6.1.2 Attach the round-bottom flask containing the sample extract to the rotary evaporator. Slowly apply vacuum to the system, and begin rotating the sample flask.

12.6.1.3 Lower the flask into the water bath, and adjust the speed of rotation and the temperature as required to complete concentration in 15 to 20 minutes. At the proper rate of concentration, the flow of solvent into the receiving flask will be steady, but no bumping or visible boiling of the extract will occur.

Note: *If the rate of concentration is too fast, analyte loss may occur.*

12.6.1.4 When the liquid in the concentration flask has reached an apparent volume of approximately 2 mL, remove the flask from the water bath and stop the rotation. Slowly and carefully admit air into the system. Be sure not to open the valve so quickly that the sample is blown out of the flask. Rinse the feed tube with approximately 2 mL of solvent.

12.6.1.5 Proceed to Section 12.6.4 for preparation for back-extraction or micro-concentration and solvent exchange.

12.6.2 Heating mantle—Concentrate the extracts in separate round-bottom flasks.

12.6.2.1 Add one or two clean boiling chips to the round-bottom flask, and attach a three-ball macro Snyder column. Prewet the column by adding approximately 1 mL of solvent through the top. Place the round-bottom flask in a heating mantle, and apply heat as required to complete the concentration in 15 to 20 minutes. At the proper rate

of distillation, the balls of the column will actively chatter, but the chambers will not flood.

12.6.2.2 When the liquid has reached an apparent volume of approximately 10 mL, remove the round-bottom flask from the heating mantle and allow the solvent to drain and cool for at least 10 minutes. Remove the Snyder column and rinse the glass joint into the receiver with small portions of solvent.

12.6.2.3 Proceed to Section 12.6.4 for preparation for back-extraction or micro-concentration and solvent exchange.

12.6.3 Kuderna-Danish (K-D)—Concentrate the extracts in separate 500-mL K-D flasks equipped with 10-mL concentrator tubes. The K-D technique is used for solvents such as methylene chloride and hexane. Toluene is difficult to concentrate using the K-D technique unless a water bath fed by a steam generator is used.

12.6.3.1 Add 1 to 2 clean boiling chips to the receiver. Attach a three-ball macro Snyder column. Prewet the column by adding approximately 1 mL of solvent through the top. Place the K-D apparatus in a hot water bath so that the entire lower rounded surface of the flask is bathed with steam.

12.6.3.2 Adjust the vertical position of the apparatus and the water temperature as required to complete the concentration in 15 to 20 minutes. At the proper rate of distillation, the balls of the column will actively chatter but the chambers will not flood.

12.6.3.3 When the liquid has reached an apparent volume of 1 mL, remove the K-D apparatus from the bath and allow the solvent to drain and cool for at least 10 minutes. Remove the Snyder column and rinse the flask and its lower joint into the concentrator tube with 1 to 2 mL of solvent. A 5-mL syringe is recommended for this operation.

12.6.3.4 Remove the three-ball Snyder column, add a fresh boiling chip, and attach a two ball micro Snyder column to the concentrator tube. Prewet the column by adding approximately 0.5 mL of solvent through the top. Place the apparatus in the hot water bath.

12.6.3.5 Adjust the vertical position and the water temperature as required to complete the concentration in 5 to 10 minutes. At the proper rate of distillation, the balls of the column will actively chatter but the chambers will not flood.

12.6.3.6 When the liquid reaches an apparent volume of 0.5 mL, remove the apparatus from the water bath and allow to drain and cool for at least 10 minutes.

12.6.3.7 Proceed to 12.6.4 for preparation for back-extraction or micro-concentration and solvent exchange.

12.6.4 Preparation for back-extraction or micro-concentration and solvent exchange.

12.6.4.1 For back-extraction (Section 12.5), transfer the extract to a 250-mL separatory funnel. Rinse the concentration vessel with small portions of hexane, adjust the hexane volume in the separatory funnel to 10 to 20 mL, and proceed to back-extraction (Section 12.5).

12.6.4.2 For determination of the weight of residue in the extract, or for clean-up procedures other than back-extraction, transfer the extract to a blowdown vial using 2-3 rinses of solvent. Proceed with micro-concentration and solvent exchange (Section 12.7).

12.7 Micro-concentration and solvent exchange.

12.7.1 Extracts to be subjected to GPC cleanup are exchanged into methylene chloride. Extracts to be cleaned up using silica gel, carbon, Florisil, and/or HPLC are exchanged into hexane.

12.7.2 Transfer the vial containing the sample extract to a nitrogen blowdown device. Adjust the flow of nitrogen so that the surface of the solvent is just visibly disturbed.

Note: *A large vortex in the solvent may cause analyte loss.*

12.7.3 Lower the vial into a 45 °C water bath and continue concentrating.

12.7.3.1 If the extract or an aliquot of the extract is to be concentrated to dryness for weight determination (Sections 12.4.8 and 13.6.4), blow dry until a constant weight is obtained.

12.7.3.2 If the extract is to be concentrated for injection into the GC/MS or the solvent is to be exchanged for extract cleanup, proceed as follows:

12.7.4 When the volume of the liquid is approximately 100 μL, add 2 to 3 mL of the desired solvent (methylene chloride for GPC and HPLC, or hexane for the other

cleanups) and continue concentration to approximately 100 μL. Repeat the addition of solvent and concentrate once more.

12.7.5 If the extract is to be cleaned up by GPC, adjust the volume of the extract to 5.0 mL with methylene chloride. If the extract is to be cleaned up by HPLC, concentrate the extract to 1.0 mL. Proceed with GPC or HPLC cleanup (Section 13.2 or 13.5, respectively).

12.7.6 If the extract is to be cleaned up by column chromatography (silica gel, Carbopak/Celite, or Florisil), bring the final volume to 1.0 mL with hexane. Proceed with column cleanup (Sections 13.3, 13.4, or 13.7).

12.7.7 If the extract is to be concentrated for injection into the GC/MS (Section 14), quantitatively transfer the extract to a 0.3-mL conical vial for final concentration, rinsing the larger vial with hexane and adding the rinse to the conical vial. Reduce the volume to approximately 100 μL. Add 20 μL of nonane to the vial, and evaporate the solvent to the level of the nonane. Seal the vial and label with the sample number. Store in the dark at room temperature until ready for GC/MS analysis. If GC/MS analysis will not be performed on the same day, store the vial at <-10 °C.

13.0 Extract cleanup

13.1 Cleanup may not be necessary for relatively clean samples (e.g., treated effluents, groundwater, drinking water). If particular circumstances require the use of a cleanup procedure, the laboratory may use any or all of the procedures below or any other appropriate procedure. Before using a cleanup procedure, the laboratory must demonstrate that the requirements of Section 9.2 can be met using the cleanup procedure.

13.1.1 Gel permeation chromatography (Section 13.2) removes high molecular weight interferences that cause GC column performance to degrade. It should be used for all soil and sediment extracts. It may be used for water extracts that are expected to contain high molecular weight organic compounds (e.g., polymeric materials, humic acids). It should also be used for tissue extracts after initial cleanup on the anthropogenic isolation column (Section 13.6).

13.1.2 Acid, neutral, and basic silica gel (Section 13.3) and Florisil (Section 13.7) are used to remove non-polar and polar interferences.

13.1.3 Carbopak/Celite (Section 13.4) can be used to separate CBs 77, 126, and 169 from the mono- and di- ortho-substituted CBs, if desired.

13.1.4 HPLC (Section 13.5) is used to provide specificity for certain congeners and congener groups.

13.1.5 The anthropogenic isolation column (Section 13.6) is used for removal of lipids from tissue samples.

13.2 Gel permeation chromatography (GPC)

13.2.1 Column packing

13.2.1.1 Place 70 to 75 g of SX-3 Bio-beads (Section 6.7.1.1) in a 400- to 500-mL beaker.

13.2.1.2 Cover the beads with methylene chloride and allow to swell overnight (a minimum of 12 hours).

13.2.1.3 Transfer the swelled beads to the column (Section 6.7.1.1) and pump solvent through the column, from bottom to top, at 4.5 to 5.5 mL/minute prior to connecting the column to the detector.

13.2.1.4 After purging the column with solvent for 1 to 2 hours, adjust the column head pressure to 7 to 10 psig and purge for 4 to 5 hours to remove air. Maintain a head pressure of 7 to 10 psig. Connect the column to the detector (Section 6.7.1.4).

13.2.2 Column calibration

13.2.2.1 Load 5 mL of the GPC calibration solution (Section 7.4) into the sample loop.

13.2.2.2 Inject the GPC calibration solution and record the signal from the detector. The elution pattern will be corn oil, BEHP, methoxychlor, perylene, and sulfur.

13.2.2.3 Set the "dump time" to allow >85% removal of BEHP and >85% collection of methoxychlor.

13.2.2.4 Set the "collect time" to the time of the sulfur peak maximum.

13.2.2.5 Verify calibration with the GPC calibration solution after every 20 extracts. Calibration is verified if the recovery of the methoxychlor is greater than 85%. If calibration is not verified, the system must be recalibrated using the GPC calibration solution, and the previous sample batch must be re-extracted and cleaned up using the calibrated GPC system.

13.2.3 Extract cleanup—GPC requires that the column not be overloaded. The column specified in this Method is designed to handle a maximum of 0.5 g of material

from an aqueous, soil, or mixed-phase sample in a 5-mL extract, and has been shown to handle 1.5 g of lipid from a tissue sample in a 5-mL extract. If the extract is known or expected to contain more than these amounts, the extract is split into aliquots for GPC, and the aliquots are combined after elution from the column. The residue content of the extract may be obtained gravimetrically by evaporating the solvent from a 50-μL aliquot.

13.2.3.1 Filter the extract or load through the filter holder (Section 6.7.1.3) to remove particles. Load the 5.0-mL extract onto the column.

13.2.3.2 Elute the extract using the calibration data determined in Section 13.2.2. Collect the eluate in a clean 400- to 500-mL beaker. Allow the system to rinse for additional 10 minutes before injecting the next sample.

13.2.3.3 Rinse the sample loading tube thoroughly with methylene chloride between extracts to prepare for the next sample.

13.2.3.4 If an extract is encountered that could overload the GPC column to the extent that carry-over could occur, a 5.0-mL methylene chloride blank must be run through the system to check for carry-over.

13.2.3.5 Concentrate the eluate per Sections 12.6 and 12.7 for further cleanup or injection into the GC/MS.

13.3 Silica gel cleanup.

13.3.1 Place a glass-wool plug in a 15-mm ID chromatography column (Section 6.7.4.2). Pack the column bottom to top with: 1 g silica gel (Section 7.5.1.1), 4 g basic silica gel (Section 7.5.1.3), 1 g silica gel, 8 g acid silica gel (Section 7.5.1.2), 2 g silica gel, and 4 g granular anhydrous sodium sulfate (Section 7.2.1). Tap the column to settle the adsorbents.

13.3.2 Pre-elute the column with 50 to 100 mL of hexane. Close the stopcock when the hexane is within 1 mm of the sodium sulfate. Discard the eluate. Check the column for channeling. If channeling is present, discard the column and prepare another.

13.3.3 Apply the concentrated extract to the column. Open the stopcock until the extract is within 1 mm of the sodium sulfate.

13.3.4 Rinse the receiver twice with 1-mL portions of hexane, and apply separately to the column. Elute the CBs with 25 mL of hexane and collect the eluate.

13.3.5 Concentrate the eluate per Section 12.6 and 12.7 for further cleanup or injection into the HPLC or GC/MS.

13.3.6 For extracts of samples known to contain large quantities of other organic compounds, it may be advisable to increase the capacity of the silica gel column. This may be accomplished by increasing the strengths of the acid and basic silica gels. The acid silica gel (Section 7.5.1.2) may be increased in strength to as much as 40% w/w (6.7 g sulfuric acid added to 10 g silica gel). The basic silica gel (Section 7.5.1.3) may be increased in strength to as much as 33% w/w (50 mL 1N NaOH added to 100 g silica gel), or the potassium silicate (Section 7.5.1.4) may be used.

Note: *The use of stronger acid silica gel (44% w/w) may lead to charring of organic compounds in some extracts. The charred material may retain some of the analytes and lead to lower recoveries of the CBs. Increasing the strengths of the acid and basic silica gel may also require different volumes of hexane than those specified above to elute the analytes from the column. The performance of the Method after such modifications must be verified by the procedure in Section 9.2.*

13.4 Carbon column (Reference 17)

13.4.1 Cut both ends from a 50-mL disposable serological pipet (Section 6.7.3.2) to produce a 20-cm column. Fire-polish both ends and flare both ends if desired. Insert a glass-wool plug at one end, and pack the column with 3.6 g of Carbopak/Celite (Section 7.5.2.3) to form an adsorbent bed 20 cm long. Insert a glass-wool plug on top of the bed to hold the adsorbent in place.

13.4.2 Pre-elute the column with 20 mL each in succession of toluene, methylene chloride, and hexane.

13.4.3 When the solvent is within 1 mm of the column packing, apply the n-hexane sample extract to the column. Rinse the sample container twice with 1-mL portions of hexane and apply separately to the column. Apply 2 mL of hexane to complete the transfer.

13.4.4 Elute the column with 25 mL of n-hexane and collect the eluate. This fraction will contain the mono- and di-ortho CBs. If carbon particles are present in the eluate, filter through glass-fiber filter paper.

13.4.5 Elute the column with 15 mL of methanol and discard the eluate. The fraction discarded will contain residual lipids and other potential interferents, if present.

13.4.6 Elute the column with 15 mL of toluene and collect the eluate. This fraction will

contain CBs 77, 126, and 169. If carbon particles are present in the eluate, filter through glass-fiber filter paper.

13.4.7 Concentrate the fractions per Section 12.6 and 12.7 for further cleanup or injection into the HPLC or GC/MS.

13.5 HPLC (References 4 and 18).

13.5.1 Column calibration.

13.5.1.1 Prepare a calibration standard containing the Toxics and other congeners of interest at the concentrations of the stock solution in Table 3, or at a concentration appropriate to the response of the detector.

13.5.1.2 Inject the calibration standard into the HPLC and record the signal from the detector. Collect the eluant for reuse. Elution will be in the order of the di-ortho, mono-ortho, and non-ortho congeners.

13.5.1.3 Establish the collection time for the congeners of interest. Following calibration, flush the injection system with solvent to ensure that residual CBs are removed from the system.

13.5.1.4 Verify the calibration with the calibration solution after every 20 extracts. Calibration is verified if the recovery of the CBs is 75 to 125% compared to the calibration (Section 13.5.1.1). If calibration I s not verified, the system must be recalibrated using the calibration solution, and the previous 20 samples must be re-extracted and cleaned up using the calibrated system.

13.5.2 Extract cleanup—HPLC requires that the column not be overloaded. The column specified in this Method is designed to handle a maximum of 5-50 μg of a given CB, depending on the congener (Reference 18). If the amount of material in the extract will overload the column, split the extract into fractions and combine the fractions after elution from the column.

13.5.2.1 Rinse the sides of the vial containing the sample and adjust to the volume required for the sample loop for injection.

13.5.2.2 Inject the sample extract into the HPLC.

13.5.2.3 Elute the extract using the calibration data determined in Section 13.5.1. Collect the fraction(s) in clean 20-mL concentrator tubes.

13.5.2.4 If an extract containing greater than 500 μg of total CBs is encountered, a blank must be run through the system to check for carry-over.

13.5.2.5 Concentrate the eluate per Section 12.7 for injection into the GC/MS.

13.6 Anthropogenic isolation column (Reference 3)—Used for removal of lipids from tissue extracts.

13.6.1 Prepare the column as given in Section 7.5.3.

13.6.2 Pre-elute the column with 100 mL of hexane. Drain the hexane layer to the top of the column, but do not expose the sodium sulfate.

13.6.3 Load the sample and rinses (Section 12.4.9.2) onto the column by draining each portion to the top of the bed. Elute the CBs from the column into the apparatus used for concentration (Section 12.4.7) using 200 mL of hexane.

13.6.4 Remove a small portion (e.g, 50 μL) of the extract for determination of residue content. Estimate the percent of the total that this portion represents. Concentrate the small portion to constant weight per Section 12.7.3.1. Calculate the total amount of residue in the extract. If more than 500 mg of material remains, repeat the cleanup using a fresh anthropogenic isolation column.

13.6.5 If necessary, exchange the extract to a solvent suitable for the additional cleanups to be used (Section 13.2-13.5 and 13.7).

13.6.6 Clean up the extract using the procedures in Sections 13.2-13.5 and 13.7. GPC (Section 13.2) and Florisil (Section 13.7) are recommended as minimum additional cleanup steps.

13.6.7 Following cleanup, concentrate the extract to 20 μL as described in Section 12.7 and proceed with the analysis in Section 14.

13.7 Florisil cleanup (Reference 19).

13.7.1 Begin to drain the n-hexane from the column (Section 7.5.4.1.2). Adjust the flow rate of eluant to 4.5-5.0 mL/min.

13.7.2 When the n-hexane is within 1 mm of the sodium sulfate, apply the sample extract (in hexane) to the column. Rinse the sample container twice with 1-mL portions of hexane and apply to the column.

13.7.3 Elute the mono-ortho and di-ortho CBs with approx 165 mL of n-hexane and collect the eluate. Elute the non-ortho co-planar CBs with approx 100 mL of 6% ether:hexane and collect the eluate. The exact volumes of solvents will need to be determined for each batch of Florisil. If the mono/di-ortho CBs are not to be separated from the non-ortho co-planar CBs, elute all CBs with 6% ether:hexane.

13.7.4 Concentrate the eluate(s) per Sections 12.6-12.7 for further cleanup or for injection into the HPLC or GC/MS.

14.0 HRGC/HRMS analysis

14.1 Establish the operating conditions given in Section 10.1.

14.2 Add 2 μL of the Labeled injection internal standard spiking solution (Section 7.14) to the 20 μL sample extract immediately prior to injection to minimize the possibility of loss by evaporation, adsorption, or reaction. If an extract is to be reanalyzed and evaporation has occurred, do not add more Labeled injection internal standard spiking solution. Rather, bring the extract back to its previous volume (e.g., 19 μL) with pure nonane (18 μL if 2 μL injections are used).

14.3 Inject 1.0 or 2.0 μL of the concentrated extract containing the Labeled injection internal standards using on-column or splitless injection. The volume injected must be identical to the volume used for calibration (Section 10.3).

14.3.1 Start the GC column initial isothermal hold upon injection. Start MS data collection after the solvent peak elutes.

14.3.2 Monitor the exact m/z's at each LOC throughout the LOC retention time window. Where warranted, monitor m/z's associated with congeners at higher levels of chlorination to assure that fragments are not interfering with the m/z's for congeners at lower levels of chlorination. Also where warranted, monitor m/z's associated with interferents expected to be present.

14.3.3 Stop data collection after $^{13}C_{12}$-DeCB has eluted. Return the column to the initial temperature for analysis of the next extract or standard.

15.0 System and laboratory performance

15.1 At the beginning of each 12-hour shift during which analyses are performed, GC/MS system performance and calibration are verified for all native CBs and labeled compounds. For these tests, analysis of the CS-3 calibration verification (VER) standard (Section 7.10.1 and Table 5) and the Diluted combined 209 congener solution (Section 7.10.2.2 and Table 5) must be used to verify all performance criteria. Adjustment and/or recalibration (Section 10) must be performed until all performance criteria are met. Only after all performance criteria are met may samples, blanks, IPRs, and OPRs be analyzed.

15.2 MS resolution—Static resolving power checks must be performed at the beginning and at the end of each shift per Sections 10.2.1. If analyses are performed on successive shifts, only the beginning of shift static resolving power check is required. If the requirement in Section 10.2.1 cannot be met, the problem must be corrected before analyses can proceed. If any of the samples in the previous shift may be affected by poor resolution, those samples must be re-analyzed.

15.3 Calibration verification

15.3.1 Inject the VER (CS-3) standard using the procedure in Section 14.

15.3.2 The m/z abundance ratios for all CBs must be within the limits in Table 8; otherwise, the mass spectrometer must be adjusted until the m/z abundance ratios fall within the limits specified when the verification test is be repeated. If the adjustment alters the resolution of the mass spectrometer, resolution must be verified (Section 10.2.1) prior to repeat of the verification test.

15.3.3 The GC peak representing each native CB and labeled compound in the VER standard must be present with a S/N of at least 10; otherwise, the mass spectrometer must be adjusted and the verification test repeated.

15.3.4 Compute the concentration of the Toxics/LOC CBs by isotope dilution (Section 17.1). These concentrations are computed based on the calibration data in Section 10.

15.3.5 For each compound, compare the concentration with the calibration verification limit in Table 6. If all compounds meet the acceptance criteria, calibration has been verified and analysis of standards and sample extracts may proceed. If, however, any compound fails its respective limit, the measurement system is not performing properly. In this event, prepare a fresh calibration standard or correct the problem and repeat the resolution (Section 15.2) and verification (Section 15.3) tests, or recalibrate (Section 10). If recalibration is required, recalibration for the 209 congeners (Section 10.5) must also be performed.

15.4 Retention times and GC resolution

15.4.1 Retention times.

15.4.1.1 Absolute—The absolute retention times of the Labeled Toxics/LOC/ window defining standard congeners (Section 7.12) in the verification test (Section 15.3) must be within ±15 seconds of the respective retention times in the calibration or, if an alternate column or column system is employed, within ±15 seconds of the respective retention times in the calibration for the alternate column or column system (Section 6.9.1.2).

15.4.1.2 Relative—The relative retention times of native CBs and labeled compounds in the verification test (Section 15.3) must be within their respective RRT limits in Table 2 or, if an alternate column or column system is employed, within their respective RRT limits for the alternate column or column system (Section 6.9.1.2).

15.4.1.3 If the absolute or relative retention time of any compound is not within the limits specified, the GC is not performing properly. In this event, adjust the GC and repeat the verification test (Section 15.3) or recalibrate (Section 10), or replace the GC column and either verify calibration or recalibrate.

15.4.2 GC resolution and minimum analysis time

15.4.2.1 As a final step in calibration verification, inject the Diluted combined 209 congener solution (Section 7.10.2.2 and Table 5).

15.4.2.2 The resolution and minimum analysis time specifications in Sections 6.9.1.1.2 and 6.9.1.1.1, respectively, must be met for the SPB-octyl column or, if an alternate column or column system is employed, must be met as specified for the alternate column or column system (Section 6.9.1.2). If these specifications are not met, the GC analysis conditions must be adjusted until the specifications are met, or the column must be replaced and the calibration verification tests repeated Sections 15.4.1 through 15.4.2.2), or the system must be recalibrated (Section 10).

15.4.2.3 After the resolution and minimum analysis time specifications are met, update the retention times, relative retention times, and response factors for the all congeners except the Toxics and LOC CBs. For the Toxics and LOC CBs, the multi-point calibration data must be used (see Section 10.4 and 15.3).

15.5 Ongoing precision and recovery.

15.5.1 Analyze the extract of the ongoing precision and recovery (OPR) aliquot (Section 11.4.2.5, 11.5.4, 11.6.2, or 11.8.3.2) prior to analysis of samples from the same batch.

15.5.2 Compute the percent recovery of the Toxics/LOC CBs by isotope dilution (Section 10.4). Compute the percent recovery of each labeled compound by the internal standard method (Section 10.5).

15.5.3 For the Toxics/LOC CBs and labeled compounds, compare the recovery to the OPR limits given in Table 6. If all compounds meet the acceptance criteria,

system performance is acceptable and analysis of blanks and samples may proceed. If, however, any individual concentration falls outside of the range given, the extraction/concentration processes are not being performed properly for that compound. In this event, correct the problem, re-prepare, extract, and clean up the sample batch and repeat the ongoing precision and recovery test (Section 15.5).

15.5.4 If desired, add results that pass the specifications in Section 15.5.3 to initial and previous ongoing data for each compound in each matrix. Update QC charts to form a graphic representation of continued laboratory performance. Develop a statement of laboratory accuracy for each congener in each matrix type by calculating the average percent recovery (R) and the standard deviation of percent recovery (S_R). Express the accuracy as a recovery interval from $R - 2S_R$ to $R + 2S_R$. For example, if R = 95% and S_R = 5%, the accuracy is 85 to 105%.

15.6 Blank—Analyze the Method blank extracted with each sample batch immediately following analysis of the OPR aliquot to demonstrate freedom from contamination and freedom from carryover from the OPR analysis. The results of the analysis of the blank must meet the specifications in Section 9.5.2 before sample analyses may proceed.

16.0 Qualitative determination

A CB or labeled compound is identified in a standard, blank, or sample when all of the criteria in Sections 16.1 through 16.4 are met.

16.1 The signals for the two exact m/z's in Table 7 must be present and must maximize within the same two scans.

16.2 The signal-to-noise ratio (S/N) for the GC peak at each exact m/z must be greater than or equal to 2.5 for each CB detected in a sample extract, and greater than or equal to 10 for all CBs in the calibration and verification standards (Sections 10.3.3 and 15.3.3).

16.3 The ratio of the integrated areas of the two exact m/z's specified in Table 7 must be within the limit in Table 8, or within ±15 percent of the ratio in the midpoint (CS-3) calibration or calibration verification (VER), whichever is most recent.

16.4 The relative retention time of the peak for a CB must be within the RRT QC limits specified in Table 2 or, if an alternate column or column system is employed, within its respective RRT QC limits for the alternate column or column system (Section 6.9.1.2).

Note: *For native CBs determined by internal standard quantitation, a given CB congener may fall within more than RT window and be mis-identified unless the RRT windows are made very narrow, as in Table 2. Therefore, consistency of the RT and RRT with other congeners and the labeled compounds may be required for rigorous congener identification. Retention time regression analysis may aid in this identification.*

16.5 Because of congener overlap and the potential for interfering substances, it is possible that all of the identification criteria (Sections 16.1-16.4) may not be met. It is also possible that loss of one or more chlorines from a highly chlorinated congener may inflate or produce a false concentration for a less-chlorinated congener that elutes at the same retention time. If identification is ambiguous, an experienced spectrometrist (Section 1.4) must determine the presence or absence of the congener.

16.6 If the criteria for identification in Sections 16.1-16.5 are not met, the CB has not been identified and the result for that congener may not be reported or used for permitting or regulatory compliance purposes. If interferences preclude identification, a new aliquot of sample must be extracted, further cleaned up, and analyzed.

17.0 Quantitative determination

17.1 Isotope dilution quantitation

17.1.1 By adding a known amount of the Labeled Toxics/LOC/window-defining compounds to every sample prior to extraction, correction for recovery of the CB can be made because the native compound and its labeled analog exhibit similar effects upon extraction, concentration, and gas chromatography. Relative responses (RRs) are used in conjunction with the calibration data in Section 10.4 to determine concentrations in the final extract, so long as labeled compound spiking levels are constant.

17.1.2 Compute the concentrations in the extract of the Native Toxics/LOC CBs using the RRs from the calibration data (Section 10.4) and following equation:

$$C_{ex}\ (ng/mL) = \frac{(A1_n + A2_n)\ C_l}{(A1_l + A2_l)\ RR}$$

where:

C_{ex} = *The concentration of the PCB in the extract, and the other terms are as defined in Section 10.5.1*

17.2 Internal standard quantitation and labeled compound recovery

17.2.1 Compute the concentrations in the extract of the native compounds other than those in the Native Toxics/LOC standard, in the Labeled cleanup standard, and

in the Labeled injection internal standard (except for labeled CB 178) using the response factors determined from the calibration data (Section 10.5) and the following equation:

$$C_{ex}\ (ng/mL) = \frac{(A1_s + A2_s)\ C_{is}}{(A1_{is} + A2_{is})\ RF}$$

where:

C_{ex} = *The concentration of the labeled compound in the extract.*

The other terms are defined in Section 10.6.1

17.2.2 Using the concentration in the extract determined above, compute the percent recovery of the Labeled Toxics/LOC/window-defining CBs and the Labeled cleanup standard CBs using the following equation:

$$Recovery\ (\%) = \frac{Concentration\ found\ (\mu g/mL)}{Concentration\ spiked\ (\mu g/mL)} \times\ 100$$

17.3 The concentration of a native CB in the solid phase of the sample is computed using the concentration of the compound in the extract and the weight of the solids (Section 11.2.2.3), as follows:

$$Concentration\ in\ solid\ (ng/kg) = \frac{(C_{ex} \times V_{ex})}{W_s}$$

where:

C_{ex} = *The concentration of the compound in the extract.*

V_{ex} = *The extract volume in mL.*

W_s = *The sample weight (dry weight) in kg.*

17.4 The concentration of a native CB in the aqueous phase of the sample is computed using the concentration of the compound in the extract and the volume of water extracted (Section 11.4), as follows:

$$Concentration\ in\ aqueous\ phase\ (pg/L) = \frac{(C_{ex} \times V_{ex})}{V_s}$$

where:

C_{ex} = *The concentration of the compound in the extract.*

V_{ex} = *The extract volume in mL.*

V_s = *The sample volume in liters.*

17.5 If the SICP area at either quantitation m/z for any congener exceeds the calibration range of the system, dilute the sample extract by the factor necessary to bring the concentration within the calibration range, adjust the concentration of the Labeled injection internal standard to 100 pg/μL in the extract, and analyze an aliquot of this diluted extract. If the

CBs cannot be measured reliably by isotope dilution, dilute and analyze an aqueous sample or analyze a smaller portion of a soil, tissue, or mixed-phase sample. Adjust the CB congener concentrations, detection limits, and minimum levels to account for the dilution.

17.6 Results are reported to three significant figures for the CBs and labeled compounds found in all standards, blanks, and samples.

17.6.1 Reporting units and levels.

17.6.1.1 Aqueous samples—Report results in pg/L (parts-per-quadrillion).

17.6.1.2 Samples containing greater than 1% solids (soils, sediments, filter cake, compost)—Report results in ng/kg based on the dry weight of the sample. Report the percent solids so that the result may be converted to aqueous units.

17.6.1.3 Tissues—Report results in ng/kg of wet tissue, not on the basis of the lipid content of the tissue. Report the percent lipid content, so that the data user can calculate the concentration on a lipid basis if desired.

17.6.1.4 Reporting level.

17.6.1.4.1 Results above the minimum level of quantitation (ML) are reported for the analysis of blanks, standards, and samples. The estimated minimum levels (EMLs) in Table 2 are based on common laboratory contamination levels. A laboratory may establish an ML for a CB lower than the EMLs in Table 2. MLs may be established as low as the lowest calibration point (Table 5) provided that the concentration of the congener in a minimum of 10 blanks for a sample medium (e.g., water, soil, sludge, tissue) is significantly below the EML in Table 2. Significant means that the ML for the congener is no less than the average (mean) plus 2 standard deviations above the level in the minimum of 10 blanks (Reference 20). The blanks must be analyzed during the same period that the sample is analyzed, ideally over an approximately 1-month period.

17.6.1.4.2 Standards (VER, IPR, OPR) and samples—Report the result for each congener at or above the ML (or EML Table 2) to 3 significant figures. Report results below the ML (or EML) as <ML (where ML is the

concentration at the ML) or as required by the regulatory authority or permit.

17.6.1.4.3 Blanks—Report results above the ML (or EML) to 3 significant figures. Report results below the ML but above the MDL (or EMDL) to 2 significant figures. Report results below the MDL as <MDL (where MDL is the concentration at the MDL) or as required by the regulatory authority or permit.

17.6.1.4.4 Blank correction—Blank-corrected results may be reported in addition to reporting of separate results for samples (Section 17.6.1.4.1) and blanks (Section 17.6.1.4.2). The recommended procedure for blank correction (Reference 20) is that a result is significantly above the blank level, and the level in the blank may be subtracted, if the result is greater than the mean plus 2 standard deviations of results of analyses of 10 or more blanks for a sample medium.

17.6.2 Results for a CB in a sample that has been diluted are reported at the least dilute level at which the area at the quantitation m/z is within the calibration range (Section 17.5).

17.6.3 For a CB having a labeled analog, report results at the least dilute level at which the area at the quantitation m/z is within the calibration range (Section 17.5) and the labeled compound recovery is within the normal range for the Method (Section 9.3 and Table 6).

17.6.4 If requested, the total concentration of all congeners at a given level of chlorination (i.e., total TrCB, total PeCB, total HxCB) may be reported by summing the concentrations of all congeners identified at that LOC, including both the Toxics and other congeners.

18.0 Analysis of complex samples

18.1 Some samples may contain high levels (>10 ng/L; >1000 ng/kg) of the compounds of interest, interfering compounds, and/or polymeric materials. Some extracts may not concentrate to 20 μL (Section 12.7); others may overload the GC column and/or mass spectrometer. Fragment ions from congeners at higher levels of chlorination may interfere with determination of congeners at lower levels of chlorination.

18.2 Analyze a smaller aliquot of the sample (Section 17.5) when the extract will not concentrate to 20 μL after all cleanup procedures have been exhausted. If a smaller aliquot of soils or mixed-phase samples is analyzed, attempt to assure that the sample is

representative.

18.3 Perform integration of peak areas and calculate concentrations manually when interferences preclude computerized calculations.

18.4 Several laboratories have reported that backgrounds of many of the CB congeners are difficult to eliminate, and that these backgrounds can interfere with the determination of the CBs in environmental samples. Backgrounds of Toxics with IUPAC numbers 105, 114, 118, 123, 156, 157, and 167 are common. The effects of contamination on results for these congeners should be understood in order to make a reliable determination.

18.5 Recovery of labeled compounds—In most samples, recoveries of the labeled compounds will be similar to those from reagent water or from the alternate matrix (Section 7.6).

18.5.1 If the recovery of any of the labeled compounds is outside of the normal range (Table 6), a diluted sample must be analyzed (Section 17.5).

18.5.2 If the recovery of any of the labeled compounds in the diluted sample is outside of normal range, the calibration verification standard (Section 7.10.1 and Table 5) must be analyzed and calibration verified (Section 15.3).

18.5.3 If the calibration cannot be verified, a new calibration must be performed and the original sample extract reanalyzed.

18.5.4 If the calibration is verified and the diluted sample does not meet the limits for labeled compound recovery, the Method does not apply to the sample being analyzed and the result may not be reported or used for permitting or regulatory compliance purposes. In this case, alternate extraction and cleanup procedures in this Method or an alternate GC column must be employed to resolve the interference. If all cleanup procedures in this Method and an alternate GC column have been employed and labeled compound recovery remains outside of the normal range, extraction and/or cleanup procedures that are beyond this scope of this Method will be required to analyze the sample.

19.0 Pollution prevention

19.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Many opportunities for pollution prevention exist in laboratory operation. EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address waste generation. When wastes cannot be reduced feasibly at the source, the Agency recommends recycling as the next best option.

19.2 The CBs in this Method are used in extremely small amounts and pose little threat to the

environment when managed properly. Standards should be prepared in volumes consistent with laboratory use to minimize the disposal of excess volumes of expired standards.

19.3 For information about pollution prevention that may be applied to laboratories and research institutions, consult *Less is Better: Laboratory Chemical Management for Waste Reduction*, available from the American Chemical Society's Department of Governmental Relations and Science Policy, 1155 16th Street NW, Washington DC 20036, 202/872-4477.

20.0 Waste management

20.1 The laboratory is responsible for complying with all Federal, State, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions, and to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Compliance is also required with any sewage discharge permits and regulations. An overview of requirements can be found in *Environmental Management Guide for Small Laboratories* (EPA 233-B-98-001).

20.2 Samples containing HCl or H_2SO_4 to pH <2 are hazardous and must be neutralized before being poured down a drain or must be handled as hazardous waste.

20.3 The CBs decompose above 800 °C. Low-level waste such as absorbent paper, tissues, animal remains, and plastic gloves may be burned in an appropriate incinerator. Gross quantities (milligrams) should be packaged securely and disposed of through commercial or governmental channels that are capable of handling extremely toxic wastes.

20.4 Liquid or soluble waste should be dissolved in methanol or ethanol and irradiated with ultraviolet light with a wavelength shorter than 290 nm for several days. Use F40 BL or equivalent lamps. Analyze liquid wastes, and dispose of the solutions when the CBs can no longer be detected.

20.5 For further information on waste management, consult *The Waste Management Manual for Laboratory Personnel* and *Less is Better-Laboratory Chemical Management for Waste Reduction*, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington, D.C. 20036.

21.0 Method performance

Method 1668A was validated and preliminary data were collected in a single laboratory (Reference 21). The original version of Method 1668 was validated in two single-laboratory studies. Figure 8 is a chromatogram showing method performance at each level of chlorination.

22.0 References

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23.0 Tables and Figures

Table 1. Names, International Union of Pure and Applied Chemistry (IUPAC) numbers, and CAS Registry numbers for native and labeled chlorinated biphenyl (CB) congeners determined by isotope dilution and internal standard HRGC/HRMS.

CB congener[1]	IUPAC number	CAS registry number	Labeled analog	IUPAC analog	CAS registry number
2-MoCB	1	2051-60-7	$^{13}C_{12}$-2-MoCB[2]	1L	234432-85-0
3-MoCB	2	2051-61-8			
4-MoCB	3	2051-62-9	$^{13}C_{12}$-4-MoCB[2]	3L	208263-77-8
2,2'-DiCB	4	13029-08-8	$^{13}C_{12}$-2,2'-DiCB[2]	4L	234432-86-1
2,3-DiCB	5	16605-91-7			
2,3'-DiCB	6	25569-80-6			
2,4-DiCB	7	33284-50-3			
2,4'-DiCB[3]	8	34883-43-7			
2,5-DiCB	9	34883-39-1	$^{13}C_{12}$-2,5-DiCB[4]	9L	250694-89-4
2,6-DiCB	10	33146-45-1			
3,3'-DiCB	11	2050-67-1			
3,4-DiCB	12	2974-92-7			
3,4'-DiCB	13	2974-90-5			
3,5-DiCB	14	34883-41-5			
4,4'-DiCB	15	2050-68-2	$^{13}C_{12}$-4,4'-DiCB[2]	15L	208263-67-6
2,2',3-TrCB	16	38444-78-9			
2,2',4-TrCB	17	37680-66-3			
2,2',5-TrCB[3]	18	37680-65-2			
2,2',6-TrCB	19	38444-73-4	$^{13}C_{12}$-2,2',6-TrCB[2]	19L	234432-87-2
2,3,3'-TrCB	20	38444-84-7			
2,3,4-TrCB	21	55702-46-0			
2,3,4'-TrCB	22	38444-85-8			
2,3,5-TrCB	23	55720-44-0			
2,3,6-TrCB	24	55702-45-9			
2,3',4-TrCB	25	55712-37-3			
2,3',5-TrCB	26	38444-81-4			
2,3',6-TrCB	27	38444-76-7			
2,4,4'-TrCB[3]	28	7012-37-5	$^{13}C_{12}$-2,4,4'-TriCB[5]	28L	208263-76-7
2,4,5-TrCB	29	15862-07-4			
2,4,6-TrCB	30	35693-92-6			
2,4',5-TrCB	31	16606-02-3			
2,4',6-TrCB	32	38444-77-8			
2',3,4-TrCB	33	38444-86-9			
2',3,5-TrCB	34	37680-68-5			
3,3',4-TrCB	35	37680-69-6			
3,3',5-TrCB	36	38444-87-0			
3,4,4'-TrCB	37	38444-90-5	$^{13}C_{12}$-3,4,4'-TrCB[2]	37L	208263-79-0
3,4,5-TrCB	38	53555-66-1			
3,4',5-TrCB	39	38444-88-1			
2,2',3,3'-TeCB	40	38444-93-8			

CB congener[1]	IUPAC number	CAS registry number	Labeled analog	IUPAC analog	CAS registry number
2,2',3,4-TeCB	41	52663-59-9			
2,2',3,4'-TeCB	42	36559-22-5			
2,2',3,5-TeCB	43	70362-46-8			
2,2',3,5'-TeCB[3]	44	41464-39-5			
2,2',3,6-TeCB	45	70362-45-7			
2,2',3,6'-TeCB	46	41464-47-5			
2,2',4,4'-TeCB	47	2437-79-8			
2,2',4,5-TeCB	48	70362-47-9			
2,2',4,5'-TeCB	49	41464-40-8			
2,2',4,6-TeCB	50	62796-65-0			
2,2',4,6'-TeCB	51	68194-04-7			
2,2',5,5'-TeCB[3]	52	35693-99-3	$^{13}C_{12}$-2,2',5,5'-TeCB[4]	52L	208263-80-3
2,2',5,6'-TeCB	53	41464-41-9			
2,2',6,6'-TeCB	54	15968-05-5	$^{13}C_{12}$-2,2',6,6'-TeCB[2]	54L	234432-88-3
2,3,3',4-TeCB	55	74338-24-2			
2,3,3',4'-TeCB	56	41464-43-1			
2,3,3',5-TeCB	57	70424-67-8			
2,3,3',5'-TeCB	58	41464-49-7			
2,3,3',6-TeCB	59	74472-33-6			
2,3,4,4'-TeCB	60	33025-41-1			
2,3,4,5-TeCB	61	33284-53-6			
2,3,4,6-TeCB	62	54230-22-7			
2,3,4',5-TeCB	63	74472-34-7			
2,3,4',6-TeCB	64	52663-58-8			
2,3,5,6-TeCB	65	33284-54-7			
2,3',4,4'-TeCB[3]	66	32598-10-0			
2,3',4,5-TeCB	67	73575-53-8			
2,3',4,5'-TeCB	68	73575-52-7			
2,3',4,6-TeCB	69	60233-24-1			
2,3',4',5-TeCB	70	32598-11-1			
2,3',4',6-TeCB	71	41464-46-4			
2,3',5,5'-TeCB	72	41464-42-0			
2,3',5',6-TeCB	73	74338-23-1			
2,4,4',5-TeCB	74	32690-93-0			
2,4,4',6-TeCB	75	32598-12-2			
2',3,4,5-TeCB	76	70362-48-0			
3,3',4,4'-TeCB[3,6]	77	32598-13-3	$^{13}C_{12}$-3,3',4,4'-TeCB[2,7]	77L	105600-23-5
3,3',4,5-TeCB	78	70362-49-1			
3,3',4,5'-TeCB	79	41464-48-6			
3,3',5,5'-TeCB	80	33284-52-5			
3,4,4',5-TeCB[6]	81	70362-50-4	$^{13}C_{12}$-3,4,4',5-TeCB[7]	81L	208461-24-9
2,2',3,3',4-PeCB	82	52663-62-4			
2,2',3,3',5-PeCB	83	60145-20-2			
2,2',3,3',6-PeCB	84	52663-60-2			
2,2',3,4,4'-PeCB	85	65510-45-4			
2,2',3,4,5-PeCB	86	55312-69-1			

CB congener[1]	IUPAC number	CAS registry number	Labeled analog	IUPAC analog	CAS registry number
2,2',3,4,5'-PeCB	87	38380-02-8			
2,2',3,4,6-PeCB	88	55215-17-3			
2,2',3,4,6'-PeCB	89	73575-57-2			
2,2',3,4',5-PeCB	90	68194-07-0			
2,2',3,4',6-PeCB	91	68194-05-8			
2,2',3,5,5'-PeCB	92	52663-61-3			
2,2',3,5,6-PeCB	93	73575-56-1			
2,2',3,5,6'-PeCB	94	73575-55-0			
2,2',3,5',6-PeCB	95	38379-99-6			
2,2',3,6,6'-PeCB	96	73575-54-9			
2,2',3',4,5-PeCB	97	41464-51-1			
2,2',3',4,6-PeCB	98	60233-25-2			
2,2',4,4',5-PeCB	99	38380-01-7			
2,2',4,4',6-PeCB	100	39485-83-1			
2,2',4,5,5'-PeCB[3]	101	37680-73-2	$^{13}C_{12}$-2,2',4,5,5'-PeCB[4]	101L	104130-39-4
2,2',4,5,6'-PeCB	102	68194-06-9			
2,2',4,5,'6-PeCB	103	60145-21-3			
2,2',4,6,6'-PeCB	104	56558-16-8	$^{13}C_{12}$-2,2',4,6,6'-PeCB[2]	104L	234432-89-4
2,3,3',4,4'-PeCB[3,6]	105	32598-14-4	$^{13}C_{12}$-2,3,3',4,4'-PeCB[7]	105L	208263-62-1
2,3,3',4,5-PeCB	106	70424-69-0			
2,3,3',4',5-PeCB	107	70424-68-9			
2,3,3',4,5'-PeCB	108	70362-41-3			
2,3,3',4,6-PeCB	109	74472-35-8			
2,3,3',4',6-PeCB	110	38380-03-9			
2,3,3',5,5'-PeCB	111	39635-32-0	$^{13}C_{12}$-2,3,3',5,5'-PeCB[5]	111 L	235416-29-2
2,3,3',5,6-PeCB	112	74472-36-9			
2,3,3',5',6-PeCB	113	68194-10-5			
2,3,4,4',5-PeCB[6]	114	74472-37-0	$^{13}C_{12}$-2,3,4,4',5-PeCB[7]	114 L	208263-63-2
2,3,4,4',6-PeCB	115	74472-38-1			
2,3,4,5,6-PeCB	116	18259-05-7			
2,3,4',5,6-PeCB	117	68194-11-6			
2,3',4,4',5-PeCB[3,6]	118	31508-00-6	$^{13}C_{12}$-2,3',4,4',5-PeCB[7]	118 L	104130-40-7
2,3',4,4',6-PeCB	119	56558-17-9			
2,3',4,5,5'-PeCB	120	68194-12-7			
2,3',4,5,'6-PeCB	121	56558-18-0			
2',3,3',4,5-PeCB	122	76842-07-4			
2',3,4,4',5-PeCB[6]	123	65510-44-3	$^{13}C_{12}$-2',3,4,4',5-PeCB[7]	123L	208263-64-3
2',3,4,5,5'-PeCB	124	70424-70-3			
2',3,4,5,6'-PeCB	125	74472-39-2			
3,3',4,4',5-PeCB[3,6]	126	57465-28-8	$^{13}C_{12}$-3,3',4,4',5-PeCB[2,7]	126L	208263-65-4
3,3',4,5,5'-PeCB	127	39635-33-1			
2,2',3,3',4,4'-HxCB[3]	128	38380-07-3			
2,2',3,3',4,5-HxCB	129	55215-18-4			
2,2',3,3',4,5'-HxCB	130	52663-66-8			
2,2',3,3',4,6-HxCB	131	61798-70-7			
2,2',3,3',4,6'-HxCB	132	38380-05-1			

CB congener[1]	IUPAC number	CAS registry number	Labeled analog	IUPAC analog	CAS registry number
2,2',3,3',5,5'-HxCB	133	35694-04-3			
2,2',3,3',5,6-HxCB	134	52704-70-8			
2,2',3,3',5,6'-HxCB	135	52744-13-5			
2,2',3,3',6,6'-HxCB	136	38411-22-2			
2,2',3,4,4',5-HxCB	137	35694-06-5			
2,2',3,4,4',5'-HxCB[3]	138	35065-28-2	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[4]	138L	208263-66-5
2,2',3,4,4',6-HxCB	139	56030-56-9			
2,2',3,4,4',6'-HxCB	140	59291-64-4			
2,2',3,4,5,5'-HxCB	141	52712-04-6			
2,2',3,4,5,6-HxCB	142	41411-61-4			
2,2',3,4,5,6'-HxCB	143	68194-15-0			
2,2',3,4,5',6-HxCB	144	68194-14-9			
2,2',3,4,6,6'-HxCB	145	74472-40-5			
2,2',3,4',5,5'-HxCB	146	51908-16-8			
2,2',3,4',5,6-HxCB	147	68194-13-8			
2,2',3,4',5,6'-HxCB	148	74472-41-6			
2,2',3,4',5',6-HxCB	149	38380-04-0			
2,2',3,4',6,6'-HxCB	150	68194-08-1			
2,2',3,5,5',6-HxCB	151	52663-63-5			
2,2',3,5,6,6'-HxCB	152	68194-09-2			
2,2',4,4',5,5'-HxCB[3]	153	35065-27-1			
2,2',4,4',5',6-HxCB	154	60145-22-4			
2,2',4,4',6,6'-HxCB	155	33979-03-2	$^{13}C_{12}$-2,2',4,4',6,6'-HxCB[2]	155L	234432-90-7
2,3,3',4,4',5-HxCB[6]	156	38380-08-4	$^{13}C_{12}$-2,3,3',4,4',5-HxCB[7]	156L	208263-68-7
2,3,3',4,4',5'-HxCB[6]	157	69782-90-7	$^{13}C_{12}$-2,3,3',4,4',5'-HxCB[7]	157L	235416-30-5
2,3,3',4,4',6-HxCB	158	74472-42-7			
2,3,3',4,5,5'-HxCB	159	39635-35-3			
2,3,3',4,5,6-HxCB	160	41411-62-5			
2,3,3',4,5',6-HxCB	161	74472-43-8			
2,3,3',4',5,5'-HxCB	162	39635-34-2			
2,3,3',4',5,6-HxCB	163	74472-44-9			
2,3,3',4',5',6-HxCB	164	74472-45-0			
2,3,3',5,5',6-HxCB	165	74472-46-1			
2,3,4,4',5,6-HxCB	166	41411-63-6			
2,3',4,4',5,5'-HxCB[6]	167	52663-72-6	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[7]	167L	208263-69-8
2,3',4,4',5',6-HxCB	168	59291-65-5			
3,3',4,4',5,5'-HxCB[3,6]	169	32774-16-6	$^{13}C_{12}$-3,3',4,4',5,5'-HxCB[2,7]	169L	208263-70-1
2,2',3,3',4,4',5-HpCB[3]	170	35065-30-6			
2,2'3,3',4,4',6-HpCB	171	52663-71-5			
2,2',3,3',4,5,5'-HpCB	172	52663-74-8			
2,2',3,3',4,5,6-HpCB	173	68194-16-1			
2,2',3,3',4,5,6'-HpCB	174	38411-25-5			
2,2',3,3',4,5',6-HpCB	175	40186-70-7			
2,2',3,3',4,6,6'-HpCB	176	52663-65-7			
2,2',3,3',4',5,6-HpCB	177	52663-70-4			
2,2',3,3',5,5',6-HpCB	178	52663-67-9	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[5]	178L	232919-67-4

CB congener[1]	IUPAC number	CAS registry number	Labeled analog	IUPAC analog	CAS registry number
2,2',3,3',5,6,6'-HpCB	179	52663-64-6			
2,2',3,4,4',5,5'-HpCB[3]	180	35065-29-3			
2,2',3,4,4',5,6-HpCB	181	74472-47-2			
2,2',3,4,4',5,6'-HpCB	182	60145-23-5			
2,2',3,4,4',5',6-HpCB	183	52663-69-1			
2,2',3,4,4',6,6'-HpCB	184	74472-48-3			
2,2',3,4,5,5',6-HpCB	185	52712-05-7			
2,2',3,4,5,6,6'-HpCB	186	74472-49-4			
2,2',3,4',5,5',6-HpCB[3]	187	52663-68-0			
2,2',3,4',5,6,6'-HpCB	188	74487-85-7	$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB[2]	188L	234432-91-8
2,3,3',4,4',5,5'-HpCB[6]	189	39635-31-9	$^{13}C_{12}$-2,3,3',4,4',5,5'-HpCB[2,7]	189L	208263-73-4
2,3,3',4,4',5,6-HpCB	190	41411-64-7			
2,3,3',4,4',5',6-HpCB	191	74472-50-7			
2,3,3',4,5,5',6-HpCB	192	74472-51-8			
2,3,3',4',5,5',6-HpCB	193	69782-91-8			
2,2',3,3',4,4',5,5'-OcCB	194	35694-08-7	$^{13}C_{12}$-2,2',3,3',4,4',5,5'-OcCB[4]	194L	208263-74-5
2,2',3,3',4,4',5,6-OcCB[3]	195	52663-78-2			
2,2',3,3',4,4',5,6'-OcCB	196	42740-50-1			
2,2',3,3',4,4',6,6'-OcCB	197	33091-17-7			
2,2',3,3',4,5,5',6-OcCB	198	68194-17-2			
2,2',3,3',4,5,5',6'-OcCB	199	52663-75-9			
2,2',3,3',4,5,6,6'-OcCB	200	52663-73-7			
2,2',3,3',4,5',6,6'-OcCB	201	40186-71-8			
2,2',3,3',5,5',6,6'-OcCB	202	2136-99-4	$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB[2]	202L	105600-26-8
2,2',3,4,4',5,5',6-OcCB	203	52663-76-0			
2,2',3,4,4',5,6,6'-OcCB	204	74472-52-9			
2,3,3',4,4',5,5',6-OcCB	205	74472-53-0	$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB[2]	205L	234446-64-1
2,2',3,3',4,4',5,5',6-NoCB[3]	206	40186-72-9	$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB[2]	206L	208263-75-6
2,2',3,3',4,4',5,6,6'-NoCB	207	52663-79-3			
2,2',3,3',4,5,5',6,6'-NoCB	208	52663-77-1	$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-NoCB[2]	208L	234432-92-9
DeCB[3]	209	2051-24-3	$^{13}C_{12}$-DeCB[2]	209L	105600-27-9

1. Abbreviations for chlorination levels
   - MoCB = monochlorobiphenyl
   - DiCB = dichlorobiphenyl
   - TrCB = trichlorobiphenyl
   - TeCB = tetrachlorbiphenyl
   - PeCB = pentachlorobiphenyl
   - HxCB = hexachlorobiphenyl
   - HpCB = heptachlorobiphenyl
   - OcCB = octachlorobiphenyl
   - NoCB = nonachlorobiphenyl
   - DeCB = decachlorobiphenyl
2. Labeled level of chlorination (LOC) window-defining congener
3. National Oceanic and Atmospheric Administration (NOAA) congener of interest
4. Labeled injection internal standard
5. Labeled clean-up standard

6. World Health Organization (WHO) toxic congener
7. Labeled analog of WHO toxic congener

Table 2. Retention times (RT), RT references, relative retention times (RRTs), estimated method detection limits (EMDLs), and estimated minimum levels (EMLs) for the 209 CB congeners on SPB-Octyl.

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
Compounds using 9L ($^{13}C_{12}$-2,5-DiCB) as Labeled injection internal standard												
	CB congener											
	Monochlorobiphenyls											
1	1	1L	13:44	1.0012	0.9951-1.0073	10	1L	82	200	8	20	10
1	2	3L	16:08	0.9878	0.9847-0.9908	6	1L/3L	4	10	0.4	1	0.5
1	3	3L	16:21	1.0010	0.9980-1.0041	6	3L	88	200	9	20	10
	Dichlorobiphenyls											
2	4	4L	16:40	1.0010	0.9960-1.0060	10	4L	172	500	17	50	20
2	10	4L	16:53	1.0140	1.0110-1.0170	6	4L/15L	22	50	2	5	2
2	9	4L	18:55	1.1361	1.1331-1.1391	6	4L/15L	20	50	2	5	2
2	7	4L	19:07	1.1481	1.1451-1.1512	6	4L/15L	15	50	2	5	2
2	6	4L	19:26	1.1672	1.1642-1.1702	6	4L/15L	13	50	1	5	2
2	5	4L	19:48	1.1892	1.1862-1.1922	6	4L/15L	11	50	1	5	2
2	8	4L	19:56	1.1972	1.1942-1.2002	6	4L/15L	121	500	12	50	20
2	14	15L	21:42	0.9267	0.9246-0.9288	6	4L/15L	31	100	3	10	5
2	11	15L	22:42	0.9694	0.9673-0.9715	6	4L/15L	105	200	10	20	10
2	13	15L	23:03	0.9843	0.9822-0.9865	6	4L/15L	28	100	3	10	5
2	12	15L	23:06	0.9865	0.9843-0.9886	6	4L/15L					
2	13/12	15L	23:04	0.9851	0.9829-0.9872	6	4L/15L					
2	15	15L	23:26	1.0007	0.9972-1.0043	10	15L	183	500	18	50	20
	Trichlorobiphenyls											
3	19	19L	20:19	1.0008	0.9967-1.0049	10	19L	42	100	4	10	5
3	30	19L	22:15	1.0961	1.0936-1.0985	6	19L/37L	175	500	17	50	20
3	18	19L	22:23	1.1026	1.1002-1.1051	6	19L/37L					
3	30/18	19L	22:19	1.0993	1.0969-1.1018	6	19L/37L					
3	17	19L	22:49	1.1240	1.1215-1.1264	6	19L/37L	86	200	9	20	10
3	27	19L	23:06	1.1379	1.1355-1.1404	6	19L/37L	59	200	6	20	10
3	24	19L	23:14	1.1445	1.1420-1.1470	6	19L/37L	53	200	5	20	10
3	16	19L	23:25	1.1535	1.1511-1.1560	6	19L/37L	35	100	4	10	5
3	32	19L	24:57	1.2291	1.2266-1.2315	6	19L/37L	84	200	8	20	10
3	34	19L	25:17	1.2455	1.2430-1.2479	6	19L/37L	74	200	7	20	10
3	23	19L	25:26	1.2529	1.2504-1.2553	6	19L/37L	50	200	5	20	10

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
3	29	19L	25:47	1.2701	1.2660-1.2742	10	19L/37L	83	200	8	20	10
3	26	19L	25:48	1.2709	1.2668-1.2750	10	19L/37L					
3	26/29	19L	25:48	1.2709	1.2668-1.2750	10	19L/37L					
3	25	37L	26:04	0.8364	0.8348-0.8380	6	19L/37L	55	200	5	20	10
3	31	37L	26:25	0.8476	0.8460-0.8492	6	19L/37L	152	500	15	50	20
3	28	37L	26:44	0.8578	0.8551-0.8604	10	19L/37L	192	500	19	50	20
3	20	37L	26:49	0.8604	0.8578-0.8631	10	19L/37L					
3	28/20	37L	26:47	0.8594	0.8567-0.8620	10	19L/37L					
3	21	37L	26:58	0.8652	0.8626-0.8679	10	19L/37L	51	200	5	20	10
3	33	37L	27:01	0.8668	0.8642-0.8695	10	19L/37L					
3	21/33	37L	26:59	0.8658	0.8631-0.8684	10	19L/37L					
3	22	37L	27:29	0.8818	0.8802-0.8834	6	19L/37L	90	200	9	20	10
3	36	37L	29:05	0.9332	0.9316-0.9348	6	19L/37L	79	200	8	20	10
3	39	37L	29:30	0.9465	0.9449-0.9481	6	19L/37L	85	200	9	20	10
3	38	37L	30:10	0.9679	0.9663-0.9695	6	19L/37L	83	200	8	20	10
3	35	37L	30:42	0.9850	0.9834-0.9866	6	19L/37L	77	200	8	20	10
3	37	37L	31:11	1.0005	0.9989-1.0021	6	37L	132	500	13	50	20
	Labeled Compounds											
1	1L	9L	13:43	0.7257	0.7125-0.7390	30	9L					
1	3L	9L	16:20	0.8642	0.8510-0.8774	30	9L					
2	4L	9L	16:39	0.8810	0.8677-0.8942	30	9L					
2	15L	9L	23:25	1.2390	1.2302-1.2478	20	9L					
3	19L	9L	20:118	1.0741	1.0608-1.0873	30	9L					
3	37L	52L	31:10	1.0803	1.0716-1.0890	30	52L					
Compounds using 52L ($^{13}C_{12}$-2,2',5,5'-TeCB) as Labeled injection internal standard												
	CB congener											
	Tetrachlorobiphenyls											
4	54	54L	23:51	1.0007	0.9972-1.0042	10	54L	118	500	12	50	20
4	50	54L	26:07	1.0958	1.0923-1.0993	10	54L/81L/77L	58	200	6	20	10
4	53	54L	26:09	1.0972	1.0937-1.1007	10	54L/81L/77L					
4	50/53	54L	26:08	1.0965	1.0930-1.1000	10	54L/81L/77L					
4	45	54L	26:55	1.1294	1.1259-1.1329	10	54L/81L/77L	51	200	5	20	10
4	51	54L	26:58	1.1315	1.1280-1.1350	10	54L/81L/77L					
4	45/51	54L	26:57	1.1308	1.1273-1.1343	10	54L/81L/77L					
4	46	54L	27:18	1.1455	1.1434-1.1476	6	54L/81L/77L	101	200	10	20	10
4	52	54L	28:45	1.2063	1.2042-1.2084	6	54L/81L/77L	191	500	19	50	20

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
4	73	54L	28:52	1.2112	1.2091-1.2133	6	54L/81L/77L	160	500	16	50	20
4	43	54L	28:58	1.2154	1.2133-1.2175	6	54L/81L/77L	94	200	9	20	10
4	69	54L	29:08	1.2224	1.2189-1.2259	10	54L/81L/77L					
4	49	54L	29:16	1.2280	1.2245-1.2315	10	54L/81L/77L	115	500	11	50	20
4	69/49	54L	29:12	1.2252	1.2217-1.2287	10	54L/81L/77L					
4	48	54L	29:33	1.2399	1.2378-1.2420	6	54L/81L/77L	76	200	8	20	10
4	65	54L	29:49	1.2510	1.2476-1.2545	10	54L/81L/77L					
4	47	54L	29:50	1.2517	1.2483-1.2552	10	54L/81L/77L	195	500	19	50	20
4	44	54L	29:53	1.2538	1.2503-1.2573	10	54L/81L/77L					
4	44/47/65	54L	29:50	1.2517	1.2483-1.2552	10	54L/81L/77L					
4	62	54L	30:06	1.2629	1.2594-1.2664	10	54L/81L/77L					
4	75	54L	30:08	1.2643	1.2608-1.2678	10	54L/81L/77L	57	200	6	20	10
4	59	54L	30:12	1.2671	1.2636-1.2706	10	54L/81L/77L					
4	59/62/75	54L	30:09	1.2650	1.2615-1.2685	10	54L/81L/77L					
4	42	54L	30:26	1.2769	1.2748-1.2790	6	54L/81L/77L	61	200	6	20	10
4	41	54L	30:52	1.2951	1.2916-1.2986	10	54L/81L/77L					
4	71	54L	30:58	1.2993	1.2958-1.3028	10	54L/81L/77L	119	500	12	50	20
4	40	54L	30:01	1.2594	1.2559-1.2629	10	54L/81L/77L					
4	41/40/71	54L	30:58	1.2993	1.2958-1.3028	10	54L/81L/77L					
4	64	54L	31:12	1.3091	1.3070-1.3112	6	54L/81L/77L	70	200	7	20	10
4	72	81L	31:59	0.8336	0.8323-0.8349	6	54L/81L/77L	158	500	16	50	20
4	68	81L	32:18	0.8419	0.8406-0.8432	6	54L/81L/77L	149	500	15	50	20
4	57	81L	32:46	0.8540	0.8527-0.8553	6	54L/81L/77L	125	500	12	50	20
4	58	81L	33:05	0.8623	0.8610-0.8636	6	54L/81L/77L	127	500	13	50	20
4	67	81L	33:13	0.8658	0.8645-0.8671	6	54L/81L/77L	147	500	15	50	20
4	63	81L	33:30	0.8732	0.8719-0.8745	6	54L/81L/77L	138	500	14	50	20
4	61	81L	33:46	0.8801	0.8775-0.8827	12	54L/81L/77L					
4	70	81L	33:53	0.8831	0.8805-0.8858	12	54L/81L/77L					
4	76	81L	33:55	0.8840	0.8814-0.8866	12	54L/81L/77L	171	500	17	50	20
4	74	54L	33:57	0.8849	0.8827-0.8871	10	54L/81L/77L					
4	61/70/74/76	81L	33:55	0.8840	0.8814-0.8866	12	54L/81L/77L					
4	66	81L	34:15	0.8927	0.8914-0.8940	6	54L/81L/77L	162	500	16	50	20
4	55	81L	34:28	0.8983	0.8970-0.8997	6	54L/81L/77L	120	500	12	50	20
4	56	81L	35:03	0.9136	0.9123-0.9149	6	54L/81L/77L	98	200	10	20	10
4	60	81L	35:16	0.9192	0.9179-0.9205	6	54L/81L/77L	131	500	13	50	20
4	80	81L	35:32	0.9262	0.9248-0.9275	6	54L/81L/77L	175	500	18	50	20

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
4	79	81L	37:16	0.9713	0.9700-0.9726	6	54L/81L/77L	173	500	17	50	20
4	78	81L	37:52	0.9870	0.9857-0.9883	6	54L/81L/77L	171	500	17	50	20
4	81	81L	38:23	1.0004	0.9991-1.0017	6	81L	177	500	18	50	20
4	77	77L	39:02	1.0004	0.9991-1.0017	6	77L	169	500	17	50	20
	Labeled compounds											
4	54L	52L	23:50	0.8261	0.8203-0.8319	20	52L					
4	81L	52L	38:22	1.3299	1.3241-1.3356	20	52L					
4	77L	52L	39:01	1.3524	1.3466-1.3582	20	52L					
Compounds using 101L ($^{13}C_{12}$-2,2',4,5,5'-PeCB) as Labeled injection internal standard												
	CB congener											
	Pentachlorobiphenyls											
5	104	104L	29:46	1.0000	0.9972-1.0028	10	104L	228	500	23	50	20
5	96	104L	30:17	1.0174	1.0146-1.0202	10	104L/123L/114L/118L/105L/126L	210	500	21	50	20
5	103	104L	32:11	1.0812	1.0795-1.0829	6	104L/123L/114L/118L/105L/126L	225	500	23	50	20
5	94	104L	32:29	1.0913	1.0896-1.0929	6	104L/123L/114L/118L/105L/126L	121	500	12	50	20
5	95	104L	33:00	1.1086	1.1058-1.1114	10	104L/123L/114L/118L/105L/126L	221	500	22	50	20
5	100	104L	33:06	1.1120	1.1092-1.1148	10	104L/123L/114L/118L/105L/126L					
5	93	104L	33:14	1.1165	1.1137-1.1193	10	104L/123L/114L/118L/105L/126L					
5	102	104L	33:21	1.1204	1.1176-1.1232	10	104L/123L/114L/118L/105L/126L					
5	98	104L	33:26	1.1232	1.1204-1.1260	10	104L/123L/114L/118L/105L/126L					
5	95/100/93/102/98	104L	33:13	1.1159	1.1131-1.1187	15	104L/123L/114L/118L/105L/126L					
5	88	104L	33:48	1.1355	1.1321-1.1389	12	104L/123L/114L/118L/105L/126L	118	500	12	50	20
5	91	104L	33:55	1.1394	1.1366-1.1422	10	104L/123L/114L/118L/105L/126L					
5	88/91	104L	33:52	1.1377	1.1344-1.1411	12	104L/123L/114L/118L/105L/126L					
5	84	104L	34:14	1.1501	1.1484-1.1517	6	104L/123L/114L/118L/105L/126L	124	500	12	50	20
5	89	104L	34:44	1.1669	1.1652-1.1685	6	104L/123L/114L/118L/105L/126L	195	500	19	50	20
5	121	104L	34:57	1.1741	1.1725-1.1758	6	104L/123L/114L/118L/105L/126L	209	500	21	50	20
5	92	123L	35:26	0.8639	0.8627-0.8651	6	104L/123L/114L/118L/105L/126L	115	500	12	50	20
5	113	104L	36:01	0.8781	0.8761-0.8801	10	104L/123L/114L/118L/105L/126L	241	1000	24	100	50
5	90	104L	36:03	0.8789	0.8769-0.8809	10	104L/123L/114L/118L/105L/126L					
5	101	104L	36:04	0.8793	0.8773-0.8813	10	104L/123L/114L/118L/105L/126L					
5	113/90/101	104L	36:03	0.8789	0.8769-0.8809	10	104L/123L/114L/118L/105L/126L					
5	83	104L	36:39	0.8935	0.8911-0.8960	12	104L/123L/114L/118L/105L/126L	217	500	22	50	20
5	99	104L	36:41	0.8944	0.8923-0.8964	10	104L/123L/114L/118L/105L/126L					
5	83/99	104L	36:40	0.8939	0.8915-0.8964	12	104L/123L/114L/118L/105L/126L					

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
5	112	104L	36:51	0.8984	0.8972-0.8996	6	104L/123L/114L/118L/105L/126L	245	1000	25	100	50
5	119	104L	37:12	0.9069	0.9037-0.9102	16	104L/123L/114L/118L/105L/126L					
5	108	104L	37:12	0.9069	0.9037-0.9102	16	104L/123L/114L/118L/105L/126L					
5	86	104L	37:17	0.9090	0.9057-0.9122	16	104L/123L/114L/118L/105L/126L	149	500	15	50	20
5	97	104L	37:17	0.9090	0.9057-0.9122	16	104L/123L/114L/118L/105L/126L					
5	125	104L	37:21	0.9106	0.9074-0.9139	16	104L/123L/114L/118L/105L/126L					
5	87	104L	37:25	0.9122	0.9102-0.9143	10	104L/123L/114L/118L/105L/126L					
5	108/119/86/97/125/87	104L	37:19	0.9098	0.9065-0.9130	16	104L/123L/114L/118L/105L/126L					
5	117	104L	37:57	0.9252	0.9228-0.9277	12	104L/123L/114L/118L/105L/126L					
5	116	104L	38:02	0.9273	0.9248-0.9297	12	104L/123L/114L/118L/105L/126L	104	200	10	20	10
5	85	104L	38:05	0.9285	0.9265-0.9305	10	104L/123L/114L/118L/105L/126L					
5	117/116/85	104L	38:00	0.9265	0.9240-0.9289	12	104L/123L/114L/118L/105L/126L					
5	110	104L	38:16	0.9330	0.9309-0.9350	10	104L/123L/114L/118L/105L/126L					
5	115	104L	38:18	0.9338	0.9317-0.9358	10	104L/123L/114L/118L/105L/126L	243	1000	24	100	50
5	110/115	104L	38:17	0.9334	0.9313-0.9354	10	104L/123L/114L/118L/105L/126L					
5	82	104L	38:40	0.9427	0.9415-0.9439	6	104L/123L/114L/118L/105L/126L	133	500	13	50	20
5	111	104L	38:52	0.9476	0.9464-0.9488	6	104L/123L/114L/118L/105L/126L	243	1000	24	100	50
5	120	104L	39:21	0.9594	0.9581-0.9606	6	104L/123L/114L/118L/105L/126L	147	500	15	50	20
5	107	104L	40:39	0.9911	0.9890-0.9931	10	104L/123L/114L/118L/105L/126L					
5	124	104L	40:40	0.9915	0.9894-0.9935	10	104L/123L/114L/118L/105L/126L	200	1000	27	100	50
5	107/124	104L	40:39	0.9911	0.9890-0.9931	10	104L/123L/114L/118L/105L/126L					
5	109	104L	40:54	0.9972	0.9959-0.9984	6	104L/123L/114L/118L/105L/126L	103	200	10	20	10
5	123	123L	41:02	1.0004	0.9992-1.0016	6	123L	150	500	15	50	20
5	106	123L	41:10	1.0037	1.0024-1.0049	6	104L/123L/114L/118L/105L/126L	143	500	14	50	20
5	118	118L	41:22	1.0004	0.9992-1.0016	6	118L	193	500	19	50	20
5	122	118L	41:49	1.0113	1.0101-1.0125	6	104L/123L/114L/118L/105L/126L	117	500	12	50	20
5	114	114L	41:58	1.0004	0.9992-1.0016	6	114L	120	500	12	50	20
5	105	105L	42:43	0.9996	0.9984-1.0008	6	105L	109	200	11	20	10
5	127	105L	44:09	1.0332	1.0320-1.0343	6	104L/123L/114L/118L/105L/126L	278	1000	28	100	50
5	126	126L	45:58	1.0004	0.9993-1.0015	6	126L	136	500	14	50	20
	Labeled compounds											
5	104L	101L	29:46	0.8257	0.8211-0.8303	20	101L					
5	123L	101L	41:01	1.1378	1.1331-1.1424	20	101L					
5	118L	101L	41:21	1.1470	1.1424-1.1516	20	101L					
5	114L	101L	41:57	1.1637	1.1590-1.1683	20	101L					
5	105L	101L	42:44	1.1854	1.1808-1.1900	20	101L					

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
5	126L	101L	45:57	1.2746	1.2700-1.2792	20	101L					
Compounds using 138L ($^{13}C_{12}$-2,2',3,4,4',5'-HxCB) as Labeled injection internal standard												
	CB congener											
	Hexachlorobiphenyls											
6	155	155L	35:44	1.0000	0.9977-1.0023	10	155L	339	1000	34	100	50
6	152	155L	36:07	1.0107	1.0093-1.0121	6	155L/156L/157L/167L	238	1000	24	100	50
6	150	155L	36:15	1.0145	1.0131-1.0159	6	155L/156L/157L/167L	328	1000	33	100	50
6	136	155L	36:44	1.0280	1.0266-1.0294	6	155L/156L/157L/167L	91	200	9	20	10
6	145	155L	37:00	1.0354	1.0340-1.0368	6	155L/156L/157L/167L	317	1000	32	100	50
6	148	155L	34:26	1.0756	1.0742-1.0770	6	155L/156L/157L/167L	324	1000	32	100	50
6	151	155L	39:10	1.0961	1.0938-1.0984	10	155L/156L/157L/167L	112	500	11	50	20
6	135	155L	39:17	1.0993	1.0970-1.1017	10	155L/156L/157L/167L					
6	154	155L	39:21	1.1012	1.0989-1.1035	10	155L/156L/157L/167L					
6	151/135/154	155L	39:15	1.0984	1.0961-1.1007	10	155L/156L/157L/167L					
6	144	155L	39:47	1.1133	1.1119-1.1147	6	155L/156L/157L/167L	167	500	17	50	20
6	147	155L	40:09	1.1236	1.1213-1.1259	10	155L/156L/157L/167L	179	500	18	50	20
6	149	155L	40:12	1.1250	1.1227-1.1273	10	155L/156L/157L/167L					
6	147/149	155L	40:10	1.1241	1.1217-1.1264	10	155L/156L/157L/167L					
6	134	155L	40:27	1.1320	1.1297-1.1343	10	155L/156L/157L/167L	134	500	13	50	20
6	143	155L	40:30	1.1334	1.1311-1.1357	10	155L/156L/157L/167L					
6	134/143	155L	40:29	1.1329	1.1306-1.1353	10	155L/156L/157L/167L					
6	139	155L	40:47	1.1413	1.1390-1.1437	10	155L/156L/157L/167L	196	500	20	50	20
6	140	155L	40:48	1.1418	1.1395-1.1441	10	155L/156L/157L/167L					
6	139/140	155L	40:47	1.1413	1.1390-1.1437	10	155L/156L/157L/167L					
6	131	155L	41:03	1.1488	1.1474-1.1502	6	155L/156L/157L/167L	121	500	12	50	20
6	142	155L	41:13	1.1535	1.1521-1.1549	6	155L/156L/157L/167L	311	1000	31	100	50
6	132	155L	41:36	1.1642	1.1618-1.1665	10	155L/156L/157L/167L	125	500	12	50	20
6	133	155L	41:57	1.1740	1.1726-1.1754	6	155L/156L/157L/167L	169	500	17	50	20
6	165	167L	42:23	0.8864	0.8853-0.8874	6	155L/156L/157L/167L	361	1000	36	100	50
6	146	167L	42:38	0.8916	0.8906-0.8926	6	155L/156L/157L/167L	182	500	18	50	20
6	161	167L	42:47	0.8947	0.8937-0.8958	6	155L/156L/157L/167L	352	1000	35	100	50
6	153	167L	43:17	0.9052	0.9035-0.9069	10	155L/156L/157L/167L	130	500	13	50	20
6	168	167L	43:21	0.9066	0.9048-0.9083	10	155L/156L/157L/167L					
6	153/168	167L	43:19	0.9059	0.9041-0.9076	10	155L/156L/157L/167L					
6	141	167L	43:34	0.9111	0.9101-0.9122	6	155L/156L/157L/167L	93	200	9	20	10
6	130	167L	44:01	0.9205	0.9195-0.9216	6	155L/156L/157L/167L	136	500	14	50	20

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
6	137	167L	44:14	0.9251	0.9240-0.9261	6	155L/156L/157L/167L	300	1000	30	100	50
6	164	167L	44:22	0.9278	0.9268-0.9289	6	155L/156L/157L/167L	136	500	14	50	20
6	138	167L	44:42	0.9348	0.9324-0.9373	14	155L/156L/157L/167L					
6	163	167L	44:42	0.9348	0.9324-0.9373	14	155L/156L/157L/167L					
6	129	167L	44:47	0.9366	0.9341-0.9390	14	155L/156L/157L/167L	211	500	21	50	20
6	160	167L	44:53	0.9387	0.9369-0.9404	10	155L/156L/157L/167L					
6	138/163/129/160	167L	44:47	0.9366	0.9341-0.9390	14	155L/156L/157L/167L					
6	158	167L	45:05	0.9428	0.9418-0.9439	6	155L/156L/157L/167L	96	200	10	20	10
6	166	167L	45:59	0.9617	0.9599-0.9634	10	155L/156L/157L/167L					
6	128	167L	46:46	0.9651	0.9634-0.9669	10	155L/156L/157L/167L	124	500	12	50	20
6	128/166	167L	46:04	0.9634	0.9617-0.9651	10	155L/156L/157L/167L					
6	159	167L	46:59	0.9826	0.9815-0.9836	6	155L/156L/157L/167L	348	1000	35	100	50
6	162	167L	47:18	0.9892	0.9881-0.9902	6	155L/156L/157L/167L	355	1000	35	100	50
6	167	167L	47:49	1.0000	0.9990-1.0010	6	155L/156L/157L/167L	115	500	11	50	20
6	156	156L/157L	49:05	0.9993	0.9983-1.0003	6	156L/157L					
6	157	156L/157L	49:09	1.0007	0.9990-1.0024	10	156L/157L	132	500	13	50	20
6	156/157	156L/157L	45:07	1.0000	0.9990-1.0010	6	156L/157L					
6	169	169L	52:31	0.9949	0.9940-0.9959	6	169L	161	500	16	50	20
	Labeled compounds											
6	155L	138L	35:44	0.7997	0.7960-0.8034	20	138L					
6	167L	138L	47:49	1.0701	1.0664-1.0739	20	138L					
6	156L	138L	49:05	1.0985	1.0974-1.0996	6	138L					
6	157L	138L	49:08	1.0996	1.0959-1.1033	20	138L					
6	156L/157L	138L	49:07	1.0992	1.0981-1.1003	6	138L					
6	169L	138L	52:30	1.1749	1.1738-1.1761	6	138L					
Compounds using 194L($^{13}C_{12}$-2,2',3,3',4,4',5,5'-OcCB) as Labeled injection internal standard												
	CB congener											
	Heptachlorobiphenyls											
7	188	188L	41:51	1.0000	0.9988-1.0012	6	188L	235	500	23	50	20
7	179	188L	42:19	1.0112	1.0100-1.0123	6	188L/189L	229	500	23	50	20
7	184	188L	42:45	1.0215	1.0203-1.0227	6	188L/189L	403	1000	40	100	50
7	176	188L	43:15	1.0335	1.0323-1.0346	6	188L/189L	385	1000	39	100	50
7	186	188L	43:45	1.0454	1.0442-1.0466	6	188L/189L	407	1000	41	100	50
7	178	188L	45:06	1.0777	1.0765-1.0789	6	188L/189L	221	500	22	50	20
7	175	188L	45:46	1.0936	1.0924-1.0948	6	188L/189L	383	1000	38	100	50
7	187	188L	46:02	1.1000	1.0988-1.1012	6	188L/189L	191	500	19	50	20

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
7	182	188L	46:14	1.1047	1.1035-1.1059	6	188L/189L	398	1000	40	100	50
7	183	188L	46:42	1.1159	1.1147-1.1171	6	188L/189L	401	1000	40	100	50
7	185	188L	46:53	1.1203	1.1191-1.1215	6	188L/189L					
7	183/185	188L	46:47	1.1179	1.1167-1.1191	6	188L/189L					
7	174	188L	47:02	1.1239	1.1227-1.1251	6	188L/189L	186	500	19	50	20
7	177	188L	47:30	1.1350	1.1338-1.1362	6	188L/189L	141	500	14	50	20
7	181	188L	47:52	1.1438	1.1426-1.1450	6	188L/189L	396	1000	40	100	50
7	171	188L	48:10	1.1509	1.1489-1.1529	10	188L/189L	374	1000	37	100	50
7	173	188L	48:11	1.1513	1.1501-1.1525	6	188L/189L					
7	171/173	188L	48:10	1.1509	1.1489-1.1529	10	188L/189L					
7	172	189L	49:47	0.9035	0.9026-0.9044	6	188L/189L	377	1000	38	100	50
7	192	189L	50:06	0.9093	0.9083-0.9102	6	188L/189L	420	1000	42	100	50
7	193	189L	50:26	0.9153	0.9144-0.9162	6	188L/189L	136	500	14	50	20
7	180	189L	50:27	0.9156	0.9147-0.9165	6	188L/189L					
7	180/193	189L	50:26	0.9153	0.9144-0.9162	6	188L/189L					
7	191	189L	50:51	0.9229	0.9220-0.9238	6	188L/189L	418	1000	42	100	50
7	170	189L	51:54	0.9419	0.9410-0.9428	6	188L/189L	162	500	16	50	20
7	190	189L	52:26	0.9516	0.9507-0.9525	6	188L/189L	234	500	23	50	20
7	189	189L	55:07	1.0003	0.9994-1.0012	6	189L	177	500	18	50	20
Octachlorobiphenyls												
8	202	202L	47:32	1.0004	0.9986-1.0021	10	202L	442	1000	44	100	50
8	201	202L	48:31	1.0210	1.0193-1.0228	10	202L/205L	440	1000	44	100	50
8	204	202L	49:11	1.0351	1.0340-1.0361	6	202L/205L	447	1000	45	100	50
8	197	202L	49:27	1.0407	1.0396-1.0417	6	202L/205L	245	1000	25	100	50
8	200	202L	49:40	1.0452	1.0442-1.0463	6	202L/205L					
8	197/200	202L	49:33	1.0428	1.0417-1.0438	6	202L/205L					
8	198	202L	52:30	1.1049	1.1031-1.1066	10	202L/205L	203	500	20	50	25
8	199	202L	52:32	1.1056	1.1045-1.1066	6	202L/205L					
8	198/199	202L	52:31	1.1052	1.1035-1.1070	10	202L/205L					
8	196	205L	53:13	0.9207	0.9198-0.9216	6	202L/205L	429	1000	43	100	50
8	203	205L	53:26	0.9245	0.9236-0.9253	6	202L/205L	444	1000	44	100	50
8	195	205L	54:55	0.9501	0.9493-0.9510	6	202L/205L	427	1000	43	100	50
8	194	205L	57:19	0.9916	0.9908-0.9925	6	202L/205L	170	500	17	50	20
8	205	205L	57:49	1.0003	0.9994-1.0012	6	205L	449	1000	45	100	50
Nonachlorobiphenyls												
9	208	208L	54:33	1.0003	0.9994-1.0012	6	208L	455	1000	46	100	50

Cl No.[1]	IUPAC No. [2,3]	RT Ref[4]	RTs[5]	RRT[6]	RRT limits[7]	Window (sec)[8]	Quantitation reference[9]	Detection limits and minimum levels - Matrix and concentration[10]				
								Water (pg/L)		Other (ng/kg)		Extract (pg/μL)
								EMDL	EML	EMDL	EML	EML
9	207	208L	55:32	1.0183	1.0174-1.0193	6	208L/206L	453	1000	45	100	50
9	206	206L	59:37	1.0003	0.9994-1.0011	6	206L	451	1000	45	100	50
Decachlorobiphenyl												
10	209	209L	61:15	1.0003	0.9995-1.0011	6	209L	153	500	15	50	20
Labeled compounds												
7	188L	194L	41:51	0.7304	0.7275-0.7333	20	194L					
7	180L	194L	50:27	0.8805	0.8775-0.8834	20	194L					
7	170L	194L	51:53	0.9055	0.9026-0.9084	20	194L					
7	189L	194L	55:06	0.9616	0.9587-0.9645	20	194L					
8	202L	194L	47:31	0.8293	0.8264-0.8322	20	194L					
8	205L	194L	57:48	1.0087	1.0044-1.0131	30	194L					
9	208L	194L	54:32	0.9517	0.9488-0.9546	20	194L					
9	206L	194L	59:36	1.0401	1.0358-1.0445	30	194L					
10	209L	194L	61:14	1.0686	1.0643-1.0730	30	194L					
Labeled clean-up standards												
3	28L	52L	26:44	0.9266	0.9209-0.9324	20	52L					
5	111L	101L	38:51	1.0777	1.0730-1.0823	20	101L					
7	178L	138L	45:05	1.0090	1.0052-1.0127	20	138L					
Labeled injection internal standards												
2	9L	138L	18:54	0.4648	0.4596-0.4699	25	178L					
4	52L	138L	28:51	0.7094	0.7043-0.7145	25	178L					
5	101L	138L	36:03	0.8865	0.8814-0.8916	25	178L					
6	138L	138L	44:41	1.0988	1.0783-1.1193	100	178L					
8	194L	138L	57:18	1.4090	1.4039-1.4141	25	178L					

1. Number of chlorines on congener.
2. Suffix "L" indicates labeled compound.
3. Multiple congeners in a box indicates a group of congeners that co-elute or may not be adequately resolved on a 30-m SPB-Octyl column. Congeners included in the group are listed as the last entry in the box.
4. Retention time reference that is used to locate target congener.
5. Retention time of target congener.
6. RRT between the RT for the congener and RT for the reference.
7. Nominal limits based on an ± 0.5% of the RRT, adjusted for the nearest eluted isomer.
8. RT window width for congener or group of two or more congeners.

9. Labeled congeners that form the quantitation reference. Areas from the exact m/z's of the congeners listed in the quantitation reference are summed, and divided by the number of congeners in the quantitation reference. For example, for congener 10, the areas at the exact m/z's for 4L and 15L are summed and the sum is divided by 2 (because there are 2 congeners in the quantitation reference).
10. EMDLs and EMLs with common laboratory interferences present. Without interferences, EMDLs and EMLs will be, respectively, 5 and 10 pg/L for aqueous samples, 0.5 and 1.0 ng/kg for soil, tissue, and mixed-phase samples, and EMLs for extracts will be 0.5 pg/uL.

Table 3. Concentrations of native and labeled chlorinated biphenyls in stock solutions, spiking solutions, and final extracts

	Solution concentrations		
CB congener	**Stock (μg/mL)**	**Spiking (ng/mL)**	**Extract (ng/mL)**
Native Toxics/LOC[1]			
1	20	1.0	50
3	20	1.0	50
4	20	1.0	50
15	20	1.0	50
19	20	1.0	50
37	20	1.0	50
54	20	1.0	50
77	20	1.0	50
81	20	1.0	50
104	20	1.0	50
105	20	1.0	50
114	20	1.0	50
118	20	1.0	50
123	20	1.0	50
126	20	1.0	50
155	20	1.0	50
156	20	1.0	50
157	20	1.0	50
167	20	1.0	50
169	20	1.0	50
188	20	1.0	50
189	20	1.0	50
202	20	1.0	50
205	20	1.0	50
206	20	1.0	50
208	20	1.0	50
209	20	1.0	50
Native congener mix stock solutions[2]			
MoCB thru TrCB	2.5		
TeCB thru HpCB	5.0		
OcCB thru DeCB	7.5		
Labeled Toxics/LOC/window-defining[3]			
1L	1.0	2.0	100
3L	1.0	2.0	100
4L	1.0	2.0	100

	Solution concentrations		
CB congener	**Stock (μg/mL)**	**Spiking (ng/mL)**	**Extract (ng/mL)**
15L	1.0	2.0	100
19L	1.0	2.0	100
37L	1.0	2.0	100
54L	1.0	2.0	100
77L	1.0	2.0	100
81L	1.0	2.0	100
104L	1.0	2.0	100
105L	1.0	2.0	100
114L	1.0	2.0	100
118L	1.0	2.0	100
123L	1.0	2.0	100
126L	1.0	2.0	100
155L	1.0	2.0	100
156L	1.0	2.0	100
157L	1.0	2.0	100
167L	1.0	2.0	100
169L	1.0	2.0	100
188L	1.0	2.0	100
189L	1.0	2.0	100
202L	1.0	2.0	100
205L	1.0	2.0	100
206L	1.0	2.0	100
208L	1.0	2.0	100
209L	1.0	2.0	100
Labeled clean-up[4]			
28L	1.0	2.0	100
111L	1.0	2.0	100
178L	1.0	2.0	100
Labeled injection internal[5]			
9L	5.0	1000	100
52L	5.0	1000	100
101L	5.0	1000	100
138L	5.0	1000	100
194L	5.0	1000	100

Diluted combined 209 congener[6]		
	Solution concentration (μg/mL)	
Standard	Native	Labeled
Native congeners		
MoCB thru TrCB	50	
TeCB thru HpCB	100	
OcCB thru DeCB	150	
Labeled Toxics/LOC/window-defining		100
Labeled Cleanup		100
Labeled Injection internal		100

1. Stock solution: Section 7.8.1; Spiking solution: Section 7.11
2. Section 7.8.1.2
3. Stock solution: Section 7.9.1; Spiking solution: Section 7.12
4. Stock solution: Section 7.9.2; Spiking solution: Section 7.13
5. Stock solution: Section 7.9.3; Spiking solution: Section 7.14
6. Section 7.10.2.2.2

Table 4. Composition of individual native CB congener solutions[1]

Solution identifier				
A2	**B2**	**C2**	**D2**	**E2**
Accu-Standard part number				
M-1668A-1	M-1668A-2	M-1668A-3	M-1668A-4	M-1668A-5
2	7	13	25	1
10	5	17	21	3
9	12	29	69	4
6	18	20	47	15
8	24	46	42	19
14	23	65	64	16
11	28	59	70	37
30	22	40	102	54
27	39	67	97	43
32	53	76	115	44
34	51	80	123	74
26	73	93	134	56
31	48	84	131	77
33	62	101	163	104
36	71	112	180	98
38	68	86		125
35	58	116		110
50	61	109/107		126
45	55	154		155
52	60	147		138
49	94	140		169
75	100	146		188
41	91	141		189
72	121	164		202
57	90	158		205
63	99	182		208
66	108/109	174		206
79	117	173		209
78	111	193		
81	107/108			
96	118			
103	114			
95	150			
88	145			
89	135			
92	149			
113	139			
83	132			
119	165			
87	168			

Solution identifier				
A2	**B2**	**C2**	**D2**	**E2**
Accu-Standard part number				
M-1668A-1	M-1668A-2	M-1668A-3	M-1668A-4	M-1668A-5
85	137			
82	160			
120	128			
124	162			
106	157			
122	184			
105	186			
127	187			
152	185			
136	181			
148	192			
151	197			
144	199/201			
143	203			
142				
133				
161				
153				
130				
129				
166				
159				
167				
156				
179				
176				
178				
175				
183				
177				
171				
172				
191				
170				
190				
201/200				
204				
200/199				
198				
196				
195				
194				

Solution identifier				
A2	**B2**	**C2**	**D2**	**E2**
Accu-Standard part number				
M-1668A-1	M-1668A-2	M-1668A-3	M-1668A-4	M-1668A-5
207				
Totals				
83	**54**	**29**	**15**	**28**

1. Congeners present in each standard listed in elution order for each level of chlorination. IUPAC number listed first; BZ number listed second where ambiguous. See Table 3 for concentrations of congeners in stock solutions and Table 5 for concentrations in calibration standard.

Table 5. Concentration of CB congeners in calibration and calibration verification standards

		Solution concentration (ng/mL)					
CB congener	**IUPAC[1]**	**CS-0.2 (Hi sens)[2]**	**CS-1**	**CS-2**	**CS-3 (VER)**	**CS-4**	**CS-5**
Native Toxics/LOC							
2-MoCB	1	0.2	1.0	5.0	50	400	2000
4-MoCB	3	0.2	1.0	5.0	50	400	2000
2,2'-DiCB	4	0.2	1.0	5.0	50	400	2000
4,4'-DiCB	15	0.2	1.0	5.0	50	400	2000
2,2',6'-TrCB	19	0.2	1.0	5.0	50	400	2000
3,4,4'-TrCB	37	0.2	1.0	5.0	50	400	2000
2,2',6,6'-TeCB	54	0.2	1.0	5.0	50	400	2000
3,3',4,4'-TeCB	77	0.2	1.0	5.0	50	400	2000
3,4,4',5-TeCB	81	0.2	1.0	5.0	50	400	2000
2,2',4,6,6'-PeCB	104	0.2	1.0	5.0	50	400	2000
2,3,3',4,4'-PeCB	105	0.2	1.0	5.0	50	400	2000
2,3,4,4',5-PeCB	114	0.2	1.0	5.0	50	400	2000
2,3',4,4',5-PeCB	118	0.2	1.0	5.0	50	400	2000
2',3,4,4',5-PeCB	123	0.2	1.0	5.0	50	400	2000
3,3',4,4',5-PeCB	126	0.2	1.0	5.0	50	400	2000
2,2',4,4',6,6'-HxCB	155	0.2	1.0	5.0	50	400	2000
2,3,3',4,4',5-HxCB	156	0.2	1.0	5.0	50	400	2000
2,3,3',4,4',5'-HxCB	157	0.2	1.0	5.0	50	400	2000
2,3',4,4',5,5'-HxCB	167	0.2	1.0	5.0	50	400	2000
3,3',4,4',5,5'-HxCB	169	0.2	1.0	5.0	50	400	2000
2,2',3,4',5,6,6'-HpCB	188	0.2	1.0	5.0	50	400	2000
2,3,3',4,4',5,5'-HpCB	189	0.2	1.0	5.0	50	400	2000
2,2',3,3',5,5',6,6'-OcCB	202	0.2	1.0	5.0	50	400	2000
2,3,3',4,4',5,5',6-OcCB	205	0.2	1.0	5.0	50	400	2000
2,2',3,3',4,4',5,5',6-NoCB	206	0.2	1.0	5.0	50	400	2000
2,2',3,3',4',5,5',6,6'-NoCB	208	0.2	1.0	5.0	50	400	2000
DeCB	209	0.2	1.0	5.0	50	400	2000
Labeled Toxics/LOC/window-defining							
$^{13}C_{12}$-2-MoCB	1L	100	100	100	100	100	100
$^{13}C_{12}$-4-MoCB	3L	100	100	100	100	100	100
$^{13}C_{12}$-2,2'-DiCB	4L	100	100	100	100	100	100
$^{13}C_{12}$-4,4'-DiCB	15L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',6'-TrCB	19L	100	100	100	100	100	100
$^{13}C_{12}$-3,4,4'-TrCB	37L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',6,6'-TeCB	54L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4'-TeCB	77L	100	100	100	100	100	100
$^{13}C_{12}$-3,4,4',5-TeCB	81L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',4,6,6'-PeCB	104L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4'-PeCB	105L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,4,4',5-PeCB	114L	100	100	100	100	100	100
$^{13}C_{12}$-2,3',4,4',5-PeCB	118L	100	100	100	100	100	100
$^{13}C_{12}$-2',3,4,4',5-PeCB	123L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4',5-PeCB	126L	100	100	100	100	100	100

		Solution concentration (ng/mL)					
CB congener	**IUPAC[1]**	**CS-0.2 (Hi sens)[2]**	**CS-1**	**CS-2**	**CS-3 (VER)**	**CS-4**	**CS-5**
$^{13}C_{12}$-2,2',4,4',6,6'-HxCB	155L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5-HxCB	156L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB	157L	100	100	100	100	100	100
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB	167L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB	169L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB	188L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5,5'-HpCB	189L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB	202L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB	205L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB	206L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4',5,5',6,6'-NoCB	208L	100	100	100	100	100	100
$^{13}C_{12}$-DeCB	209L	100	100	100	100	100	100
Labeled clean-up							
$^{13}C_{12}$-2,4,4'-TrCB	28L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',5,5'-PeCB	111L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB	178L	100	100	100	100	100	100
Labeled injection internal							
$^{13}C_{12}$-2,5-DiCB	9L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',5,5'-TeCB	52L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',4',5,5'-PeCB	101L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3',4,4',5'-HxCB	138L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-OcCB	194L	100	100	100	100	100	100

1. Suffix "L" indicates labeled compound
2. Additional concentration used for calibration of high sensitivity HRGC/HRMS systems

Table 6. QC acceptance crtiteria for chlorinated biphenyls in VER, IPR, OPR, and samples[1]

Congener	IUPAC number[2]	Test conc (ng/mL)[3]	VER[4] (%)	IPR		OPR (%)	Labeled compound recovery in samples (%)
				RSD (%)	X (%)		
2-MoCB	1	50	70-130	40	60-140	50-150	
4-MoCB	3	50	70-130	40	60-140	50-150	
2,2'-DiCB	4	50	70-130	40	60-140	50-150	
4,4'-DiCB	15	50	70-130	40	60-140	50-150	
2,2'6-TrCB	19	50	70-130	40	60-140	50-150	
3,4,4'-TrCB	37	50	70-130	40	60-140	50-150	
2,2'6,6'TeCB	54	50	70-130	40	60-140	50-150	
3,3',4,4'-TeCB	77	50	70-130	40	60-140	50-150	
3,4,4',5-TeCB	81	50	70-130	40	60-140	50-150	
2,2',4,6,6'-PeCB	104	50	70-130	40	60-140	50-150	
2,3,3',4,4'-PeCB	105	50	70-130	40	60-140	50-150	
2,3,4,4',5-PeCB	114	50	70-130	40	60-140	50-150	
2,3',4,4',5-PeCB	118	50	70-130	40	60-140	50-150	
2',3,4,4',5-PeCB	123	50	70-130	40	60-140	50-150	
3,3',4,4',5-PeCB	126	50	70-130	40	60-140	50-150	
2,2',4,4',6,6'-HxCB	155	50	70-130	40	60-140	50-150	
2,3,3',4,4',5-HxCB[5]	156	50	70-130	40	60-140	50-150	
2,3,3',4,4',5'-HxCB[5]	157	50	70-130	40	60-140	50-150	
2,3',4,4',5,5'-HxCB	167	50	70-130	40	60-140	50-150	
3,3',4,4',5,5'-HxCB	169	50	70-130	40	60-140	50-150	
2,2',3,4',5,6,6'-HpCB	188	50	70-130	40	60-140	50-150	
2,3,3',4,4',5,5'-HpCB	189	50	70-130	40	60-140	50-150	
2,2',3,3',5,5',6,6'-OcCB	202	50	70-130	40	60-140	50-150	
2,3,3',4,4',5,5',6-OcCB	205	50	70-130	40	60-140	50-150	
2,2',3,3',4,4',5,5',6-NoCB	206	50	70-130	40	60-140	50-150	
2,2',3,3,'4,5,5',6,6'-NoCB	208	50	70-130	40	60-140	50-150	
DeCB	209	50	70-130	40	60-140	50-150	
$^{13}C_{12}$-2-MoCB	1L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-4-MoCB	3L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2'-DiCB	4L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-4,4'-DiCB	15L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',6-TrCB	19L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-3,4,4'-TrCB	37L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',6,6'-TeCB	54L	100	50-150	50	35-135	30-140	25-150
13C12-3,3',4,4'-TCB	77L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-3,4,4',5-TeCB	81L	100	50-150	50	35-135	30-140	25-150

Congener	IUPAC number[2]	Test conc (ng/mL)[3]	VER[4] (%)	IPR		OPR (%)	Labeled compound recovery in samples (%)
				RSD (%)	X (%)		
$^{13}C_{12}$-2,2',4,6,6'-PeCB	104L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3,3',4,4'-PeCB	105L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3,4,4',5-PeCB	114L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3',4,4',5-PeCB	118L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2',3,4,4',5-PeCB	123L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-3,3',4,4',5-PeCB	126L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',4,4',6,6'-HxCB	155L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3,3',4,4',5 -HxCB[5]	156L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB[5]	157L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB	167L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB	169L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB	188L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB	189L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB	202L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB	205L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB	206L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-NoCB	208L	100	50-150	50	35-135	30-140	25-150
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-DeCB	209L	100	50-150	50	35-135	30-140	25-150
Cleanup standard							
$^{13}C_{12}$-2,4,4'-TrCB	28L	100	60-130	45	45-120	40-125	30-135
$^{13}C_{12}$-2,3,3',5,5'-PeCB	111L	100	60-130	45	45-120	40-125	30-135
$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB	178L	100	60-130	45	45-120	40-125	30-135

1. QC acceptance criteria for IPR, OPR, and samples based on a 20 μL extract final volume
2. Suffix "L" indicates labeled compound.
3. See Table 5.
4. Section 15.3.
5. PCBs 156 and 157 are tested as the sum of two concentrations

Table 7. Scan descriptors, levels of chlorination, m/z information, and substances monitored by HRGC/HRMS

Function and chlorine level	m/z	m/z type	m/z formula	Substance
Fn-1; Cl-1	188.0393	M	$^{12}C_{12}\ H_9\ ^{35}Cl$	Cl-1 CB
	190.0363	M+2	$^{12}C_{12}\ H_9\ ^{37}Cl$	Cl-1 CB
	200.0795	M	$^{13}C_{12}\ H_9\ ^{35}Cl$	$^{13}C_{12}$ Cl-1 CB
	202.0766	M+2	$^{13}C_{12}\ H_9\ ^{37}Cl$	$^{13}C_{12}$ Cl-1 CB
	218.9856	lock	$C_4\ F_9$	PFK
Fn-2; Cl-2,3	222.0003	M	$^{12}C_{12}\ H_8\ ^{35}Cl_2$	Cl-2 PCB
	223.9974	M+2	$^{12}C_{12}\ H_8\ ^{35}Cl\ ^{37}\ Cl$	Cl-2 PCB
	225.9944	M+4	$^{12}C_{12}\ H_8\ ^{37}Cl_2$	Cl-2 PCB
	234.0406	M	$^{13}C_{12}\ H_8\ ^{35}Cl_2$	$^{13}C_{12}$ Cl-2 PCB
	236.0376	M+2	$^{13}C_{12}\ H_8\ ^{35}Cl\ ^{37}\ Cl$	$^{13}C_{12}$ Cl-2 PCB
	242.9856	lock	$C_6\ F_9$	PFK
	255.9613	M	$^{12}C_{12}\ H_7\ ^{35}Cl_3$	Cl-3 PCB
	257.9584	M+2	$^{12}C_{12}\ H_7\ ^{35}Cl_2\ ^{37}Cl$	Cl-3 PCB
Fn-3	255.9613	M	$^{12}C_{12}\ H_7\ ^{35}Cl_3$	Cl-3 PCB
Cl-3,4,5	257.9584	M+2	$^{12}C_{12}\ H_7\ ^{35}Cl_2\ ^{37}Cl$	Cl-3 PCB
	259.9554	M+4	$^{12}C_{12}\ H_7\ ^{35}Cl\ ^{37}Cl_2$	Cl-3 PCB
	268.0016	M	$^{13}C_{12}\ H_7\ ^{35}Cl_3$	$^{13}C_{12}$ Cl-3 PCB
	269.9986	M+2	$^{13}C_{12}\ H_7\ ^{35}Cl_2\ ^{37}Cl$	$^{13}C_{12}$ Cl-3 PCB
	280.9825	lock	$C_6\ F_{11}$	PFK
	289.9224	M	$^{12}C_{12}\ H_6\ ^{35}Cl_4$	Cl-4 PCB
	291.9194	M+2	$^{12}C_{12}\ H_6\ ^{35}Cl_3\ ^{37}Cl$	Cl-4 PCB
	293.9165	M+4	$^{12}C_{12}\ H_6\ ^{35}Cl_2\ ^{37}Cl_2$	Cl-4 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
	301.9626	M	$^{13}C_{12}$ H_6 $^{35}Cl_4$	$^{13}C_{12}$ Cl-4 PCB
	303.9597	M+2	$^{13}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	$^{13}C_{12}$ Cl-4 PCB
	323.8834	M	$^{12}C_{12}$ H5 $^{35}Cl_5$	Cl-5 PCB
	325.8804	M+2	$^{12}C_{12}$ H5 $^{35}Cl_4$ ^{37}Cl	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}$ H5 $^{35}Cl_3$ $^{37}Cl_2$	Cl-5 PCB
	337.9207	M+2	$^{13}C_{12}$ H5 $^{35}Cl_4$ ^{37}Cl	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}$ H5 $^{35}Cl_3$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
Fn-4	289.9224	M	$^{12}C_{12}$ H_6 $^{35}Cl_4$	Cl-4 PCB
Cl-4,5,6	291.9194	M+2	$^{12}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	Cl-4 PCB
	293.9165	M+4	$^{12}C_{12}$ H_6 $^{35}Cl_2$ $^{37}Cl_2$	Cl-4 PCB
	301.9626	M+2	$^{13}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	$^{13}C_{12}$ Cl-4 PCB
	303.9597	M+4	$^{13}C_{12}$ H_6 $^{35}Cl_2$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-4 PCB
	323.8834	M	$^{12}C_{12}$ H_5 $^{35}Cl_5$	Cl-5 PCB
	325.8804	M+2	$^{12}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	Cl-5 PCB
	330.9792	lock	C_7 F_{15}	PFK
	337.9207	M+2	$^{13}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
	359.8415	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_5$ ^{37}Cl	Cl-6 PCB
	361.8385	M+4	$^{13}C_{12}$ H_4 $^{35}Cl_4$ $^{37}Cl_2$	Cl-6 PCB
	363.8356	M+6	$^{13}C_{12}$ H_4 $^{35}Cl_3$ $^{37}Cl_2$	Cl-6 PCB
	371.8817	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_5$ ^{37}Cl	$^{13}C_{12}$ Cl-6 PCB
	373.8788	M+4	$^{13}C_{12}$ H_4 $^{35}Cl_4$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-6 PCB
Fn-5	323.8834	M	$^{12}C_{12}$ H_5 $^{35}Cl_5$	Cl-5 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
Cl-5,6,7	325.8804	M+2	$^{12}C_{12}\ H_5\ ^{35}Cl_4\ ^{37}Cl$	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}\ H_5\ ^{35}Cl_3\ ^{37}Cl_2$	Cl-5 PCB
	337.9207	M+2	$^{13}C_{12}\ H_5\ ^{35}Cl_4\ ^{37}Cl$	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}\ H_5\ ^{35}Cl_3\ ^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
	354.9792	lock	C_9F_{13}	PFK
	359.8415	M+2	$^{12}C_{12}\ H_4\ ^{35}Cl_5\ ^{37}Cl$	Cl-6 PCB
	361.8385	M+4	$^{12}C_{12}\ H_4\ ^{35}Cl_4\ ^{37}Cl_2$	Cl-6 PCB
	363.8356	M+6	$^{12}C_{12}\ H_4\ ^{35}Cl_3\ ^{37}Cl_3$	Cl-6 PCB
	371.8817	M+2	$^{13}C_{12}\ H_4\ ^{35}Cl_5\ ^{37}Cl$	$^{13}C_{12}$ Cl-6 PCB
	373.8788	M+4	$^{13}C_{12}\ H_4\ ^{35}Cl_4\ ^{37}Cl_2$	$^{13}C_{12}$ Cl-6 PCB
	393.8025	M+2	$^{12}C_{12}\ H_3\ ^{35}Cl_6\ ^{37}Cl$	Cl-7 PCB
	395.7995	M+4	$^{12}C_{12}\ H_3\ ^{35}Cl_5\ ^{37}Cl_2$	Cl-7 PCB
	397.7966	M+6	$^{12}C_{12}\ H_3\ ^{35}Cl_4\ ^{37}Cl_3$	Cl-7 PCB
	405.8428	M+2	$^{13}C_{12}\ H_3\ ^{35}Cl_6\ ^{37}Cl$	$^{13}C_{12}$ Cl-7 PCB
	407.8398	M+4	$^{13}C_{12}\ H_3\ ^{35}Cl_5\ ^{37}Cl_2$	$^{13}C_{12}$ Cl-7 PCB
	454.9728	QC	$C_{11}F_{17}$	PFK
Fn-6	393.8025	M+2	$^{12}C_{12}\ H_3\ ^{35}Cl_6\ ^{37}Cl$	Cl-7 PCB
Cl-7,8,9,10	395.7995	M+4	$^{12}C_{12}\ H_3\ ^{35}Cl_5\ ^{37}Cl_2$	Cl-7 PCB
	397.7966	M+6	$^{12}C_{12}\ H_3\ ^{35}Cl_4\ ^{37}Cl_3$	Cl-7 PCB
	405.8428	M+2	$^{13}C_{12}\ H_3\ ^{35}Cl_6\ ^{37}Cl$	$^{13}C_{12}$ Cl-7 PCB
	407.8398	M+4	$^{13}C_{12}\ H_3\ ^{35}Cl_5\ ^{37}Cl_2$	$^{13}C_{12}$ Cl-7 PCB
	427.7635	M+2	$^{12}C_{12}\ H_2\ ^{35}Cl_7\ ^{37}Cl$	Cl-8 PCB
	429.7606	M+4	$^{12}C_{12}\ H_2\ ^{35}Cl_6\ ^{37}Cl_2$	Cl-8 PCB
	431.7576	M+6	$^{12}C_{12}\ H_2\ ^{35}Cl_5\ ^{37}Cl_3$	Cl-8 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
	439.8038	M+2	$^{13}C_{12}$ H_2 $^{35}Cl_7$ ^{37}Cl	$^{13}C_{12}$ Cl-8 PCB
	441.8008	M+4	$^{13}C_{12}$ H_2 $^{35}Cl_6$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-8 PCB
	442.9728	QC	C_{10} F_{13}	PFK
	454.9728	lock	C_{11} F_{13}	PFK
	461.7246	M+2	$^{12}C_{12}$ H_1 $^{35}Cl_8$ ^{37}Cl	Cl-9 PCB
	463.7216	M+4	$^{12}C_{12}$ H_1 $^{35}Cl_7$ $^{37}Cl_2$	Cl-9 PCB
	465.7187	M+6	$^{12}C_{12}$ H_1 $^{35}Cl_6$ $^{37}Cl_3$	Cl-9 PCB
	473.7648	M+2	$^{13}C_{12}$ H_1 $^{35}Cl_8$ ^{37}Cl	$^{13}C_{12}$ Cl-9 PCB
	475.7619	M+4	$^{13}C_{12}$ H_1 $^{35}Cl_7$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-9 PCB
	495.6856	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_9$ ^{37}Cl	Cl-10 PCB
	497.6826	M+4	$^{12}C_{12}$ $^{35}Cl_8$ $^{37}Cl_2$	Cl-10 PCB
	499.6797	M+6	$^{12}C_{12}$ $^{35}Cl_7$ $^{37}Cl_3$	Cl-10 PCB
	507.7258	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_9$ ^{37}Cl	$^{13}C_{12}$ Cl-10 PCB
	509.7229	M+4	$^{13}C_{12}$ H_4 $^{35}Cl_8$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-10 PCB
	511.7199	M+6	$^{13}C_{12}$ H_4 $^{35}Cl_8$ $^{37}Cl_4$	$^{13}C_{12}$ Cl-10 PCB

1. Isotopic masses used for accurate mass calculation

^{1}H	1.0078
^{12}C	12.0000
^{13}C	13.0034
^{35}Cl	34.9689
^{37}Cl	36.9659
^{19}F	18.9984

Table 8. Theoretical ion abundance ratios and QC limits

Chlorine atoms	m/z's forming ratio	Theoretical ratio	Lower QC limit	Upper QC limit
1	m/m+2	3.13	2.66	3.60
2	m/(m+2)	1.56	1.33	1.79
3	m/(m+2)	1.04	0.88	1.20
4	m/(m+2)	0.77	0.65	0.89
5	(m+2)/(m+4)	1.55	1.32	1.78
6	(m+2)/(m+4)	1.24	1.05	1.43
7	(m+2)/(m+4)	1.05	0.89	1.21
8	(m+2)/(m+4)	0.89	0.76	1.02
9	(m+2)/(m+4)	0.77	0.65	0.89
10	(m+2)/(m+4)	0.69	0.59	0.79

Table 9. Suggested Sample Quantities to be Extracted for Various Matrices[1]

Sample matrix[2]	Example	Percent solids	Phase	Quantity extracted
Single-phase				
Aqueous	Drinking water	<1	—[3]	1000 mL
	Groundwater			
	Treated wastewater			
Solid	Dry soil	>20	Solid	10 g
	Compost			
	Ash			
Organic	Waste solvent	<1	Organic	10 g
	Waste oil			
	Organic polymer			
Tissue	Fish	—	Organic	10 g
	Human adipose			
Multi-phase				
Liquid/Solid				
Aqueous/Solid	Wet soil	1-30	Solid	10 g
	Untreated effluent			
	Digested municipal sludge			
	Filter cake			
	Paper pulp			
Organic/solid	Industrial sludge	1-100	Both	10 g
	Oily waste			
Liquid/Liquid				
Aqueous/organic	In-process effluent	<1	Organic	10 g
	Untreated effluent			
	Drum waste			
Aqueous/organic/solid	Untreated effluent	>1	Organic & solid	10 g
	Drum waste			

1. The quantity of sample to be extracted is adjusted to provide 10 g of solids (dry weight). One liter of aqueous samples containing one percent solids will contain 10 grams of solids. For aqueous samples containing greater than one percent solids, a lesser volume is used so that 10 grams of solids (dry weight) will be extracted.
2. The sample matrix may be amorphous for some samples. In general, when the CBs are in contact with a multi-phase system in which one of the phases is water, they will be preferentially dispersed in or adsorbed on the alternate phase because of their low solubility in water.
3. Aqueous samples are filtered after spiking with the labeled compounds. The filtrate and the materials trapped on the filter are extracted separately, and the extracts are combined for cleanup and analysis.

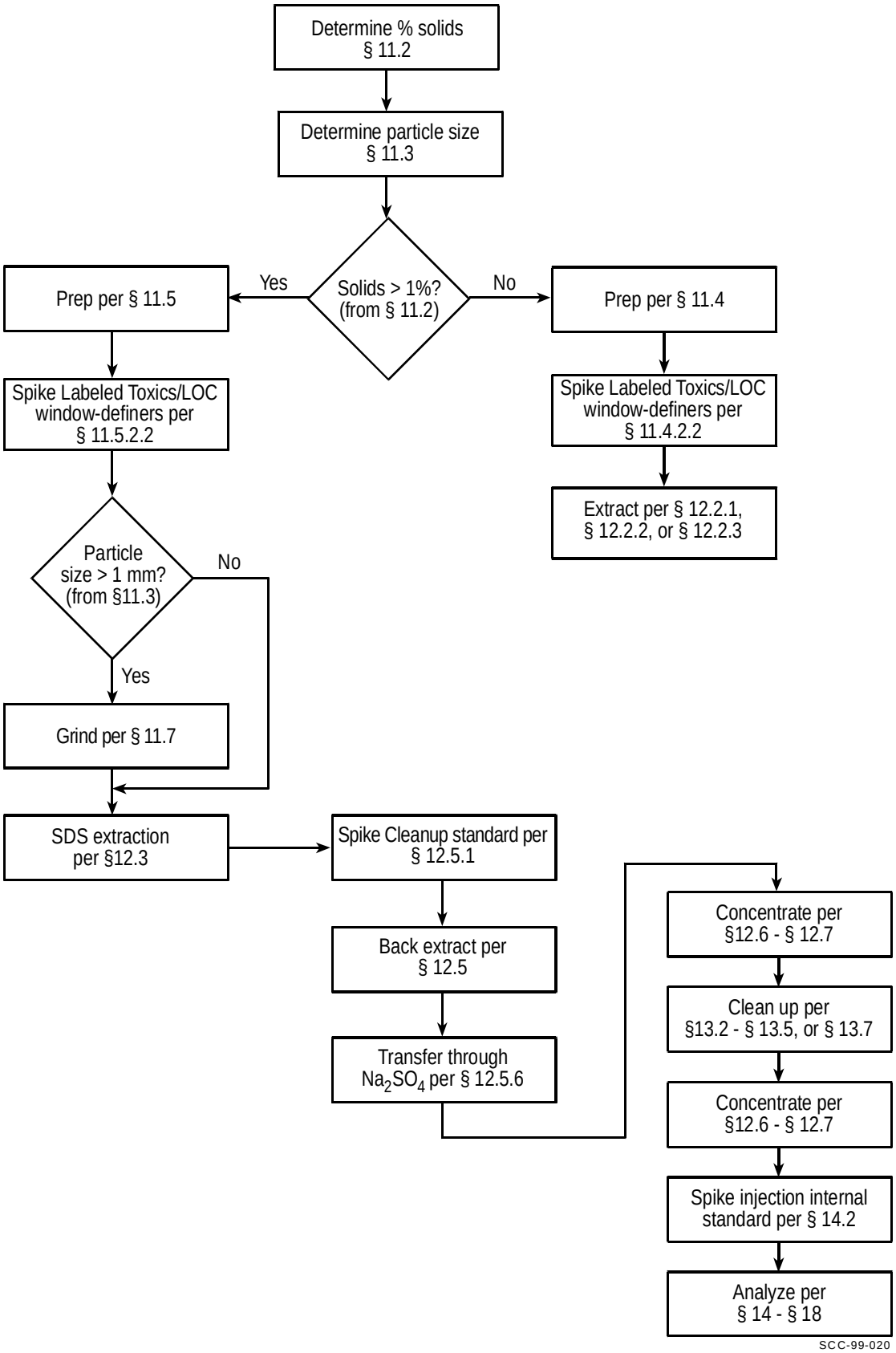

Figure 1 Flow Chart for Analysis of Aqueous and Solid Samples

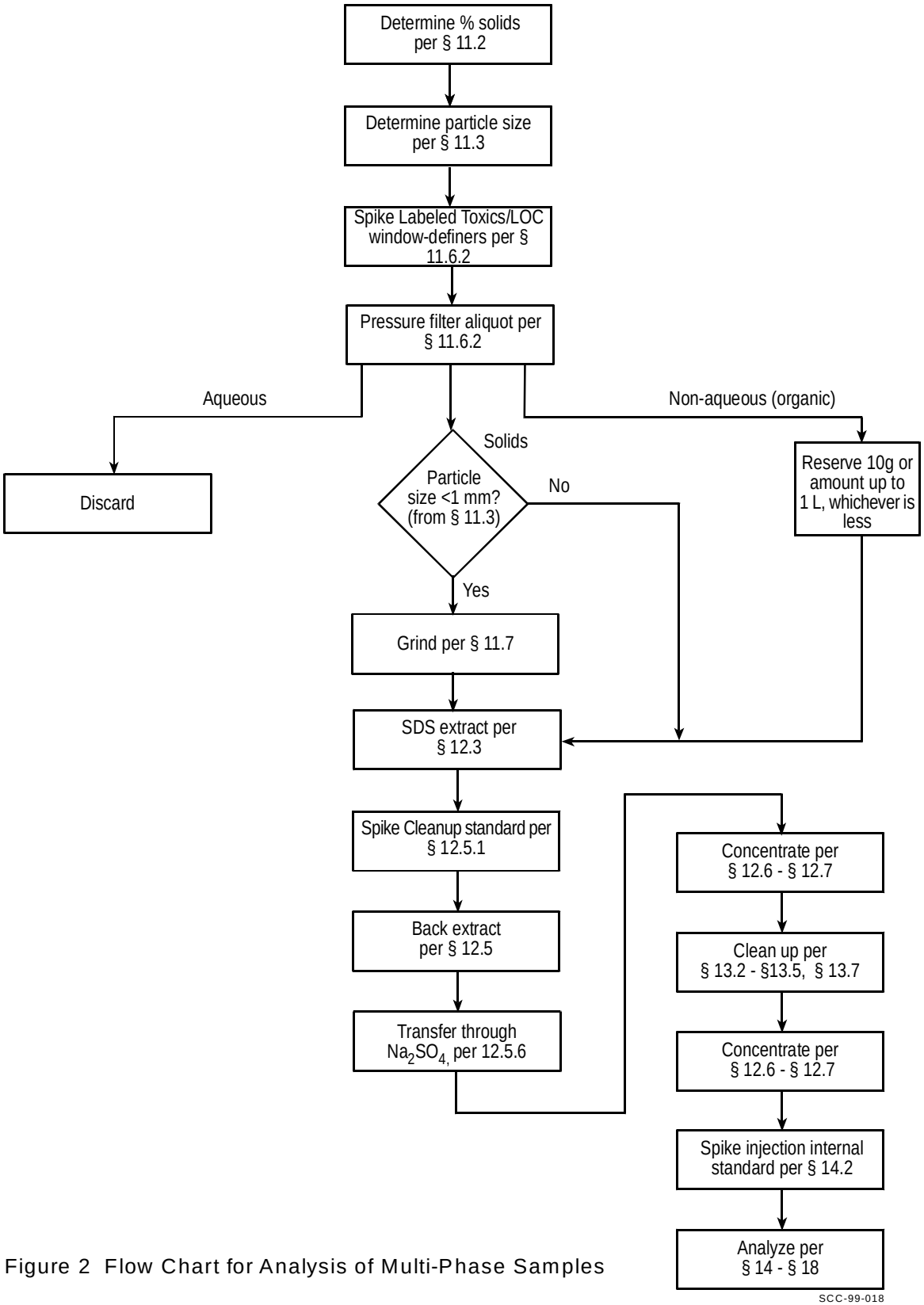

Figure 2 Flow Chart for Analysis of Multi-Phase Samples

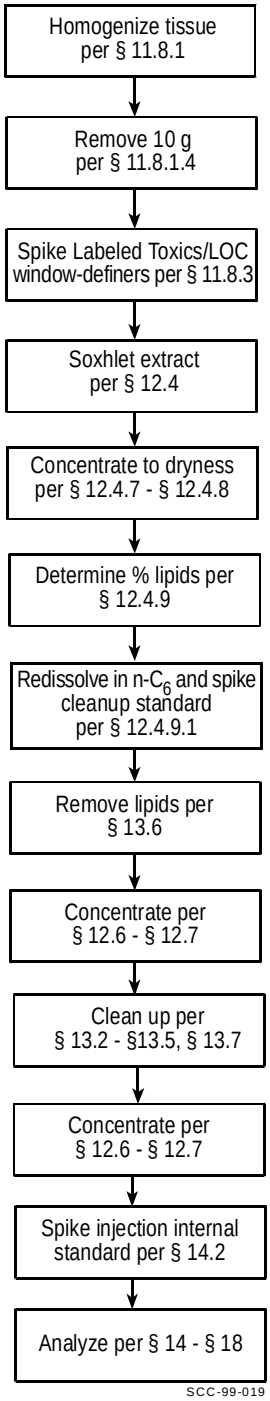

Figure 3 Flow Chart for Analysis of Tissue Samples

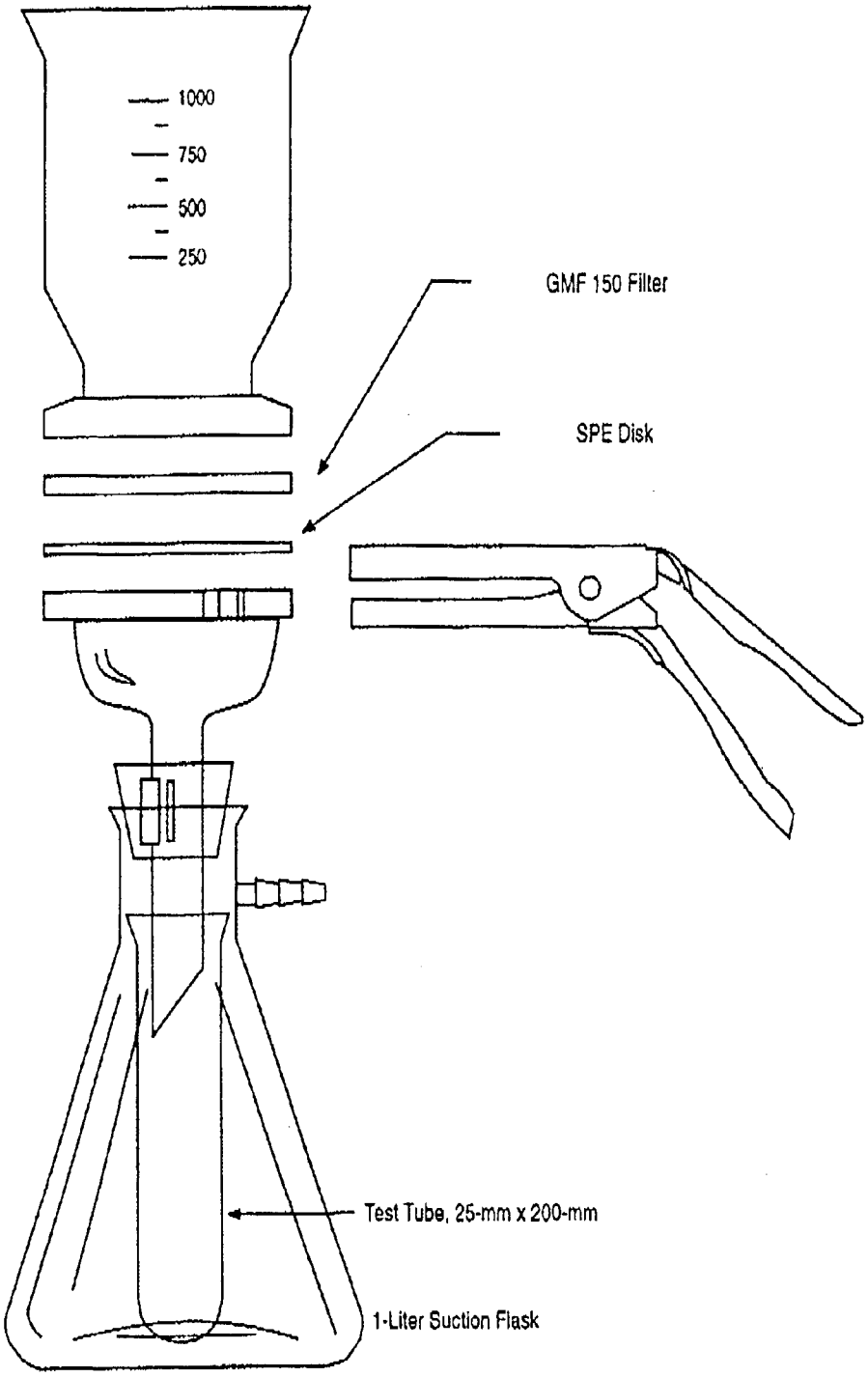

Figure 4 Solid-phase Extraction Apparatus

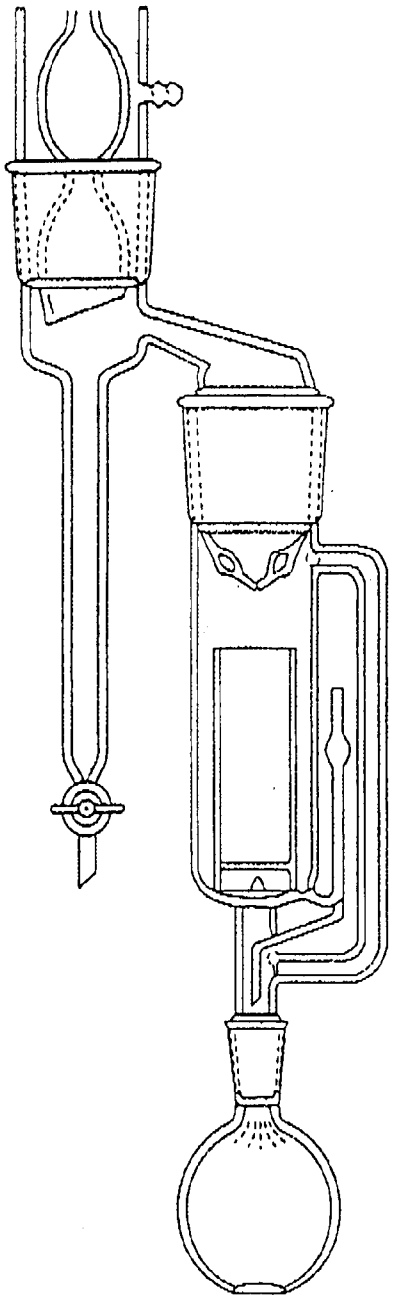

Figure 5 Soxhlet/Dean-Stark Extractor

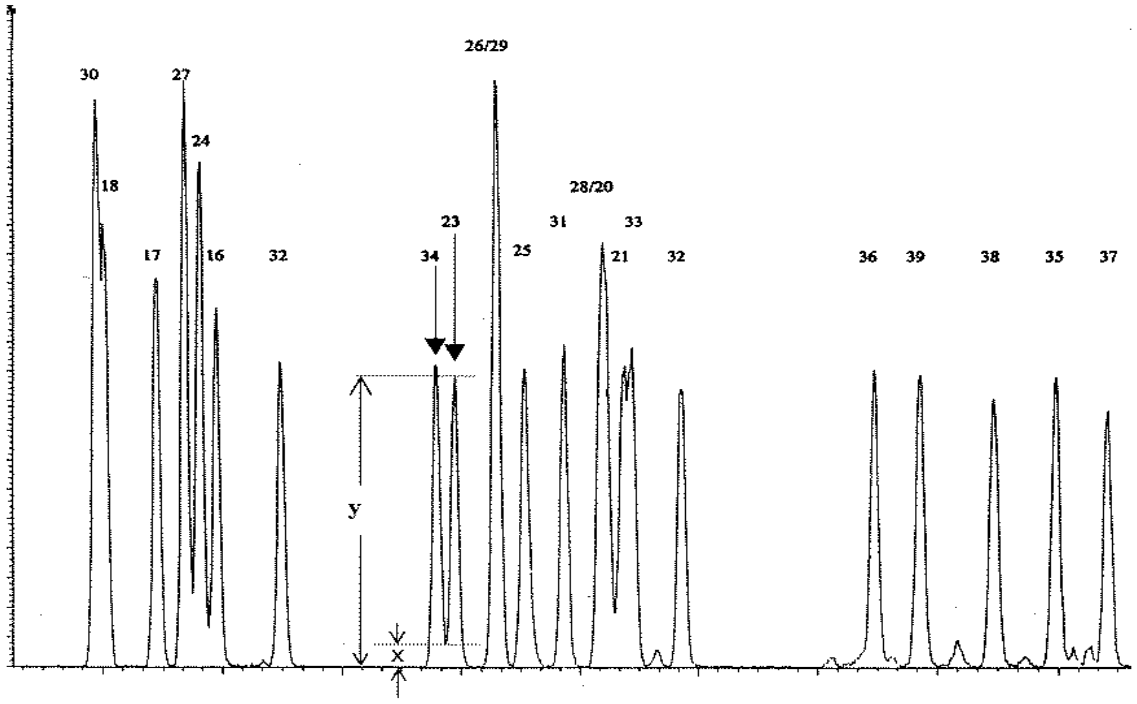

Figure 6 Octyl column resolution test #1: Separation of Cl-3 congeners 34 and 23 with valley <40% (i.e. 100x/y < 40%)

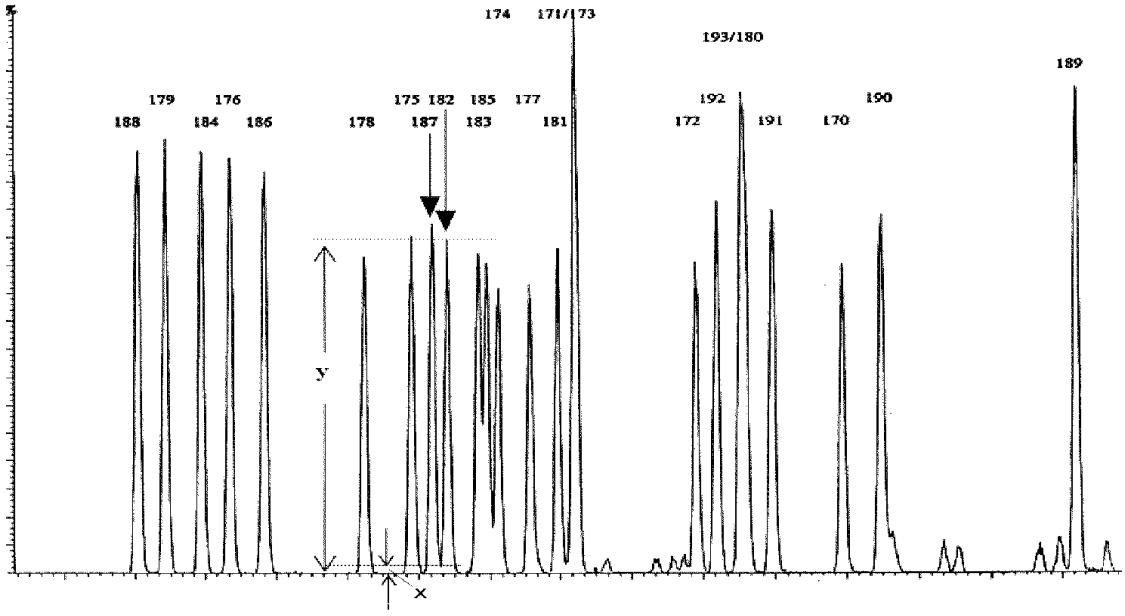

Figure 7 Octyl column resolution test #2: Separation of Cl-7 congeners 187 and 182 with valley < 40% (i.e. 100 x/y < 40%)

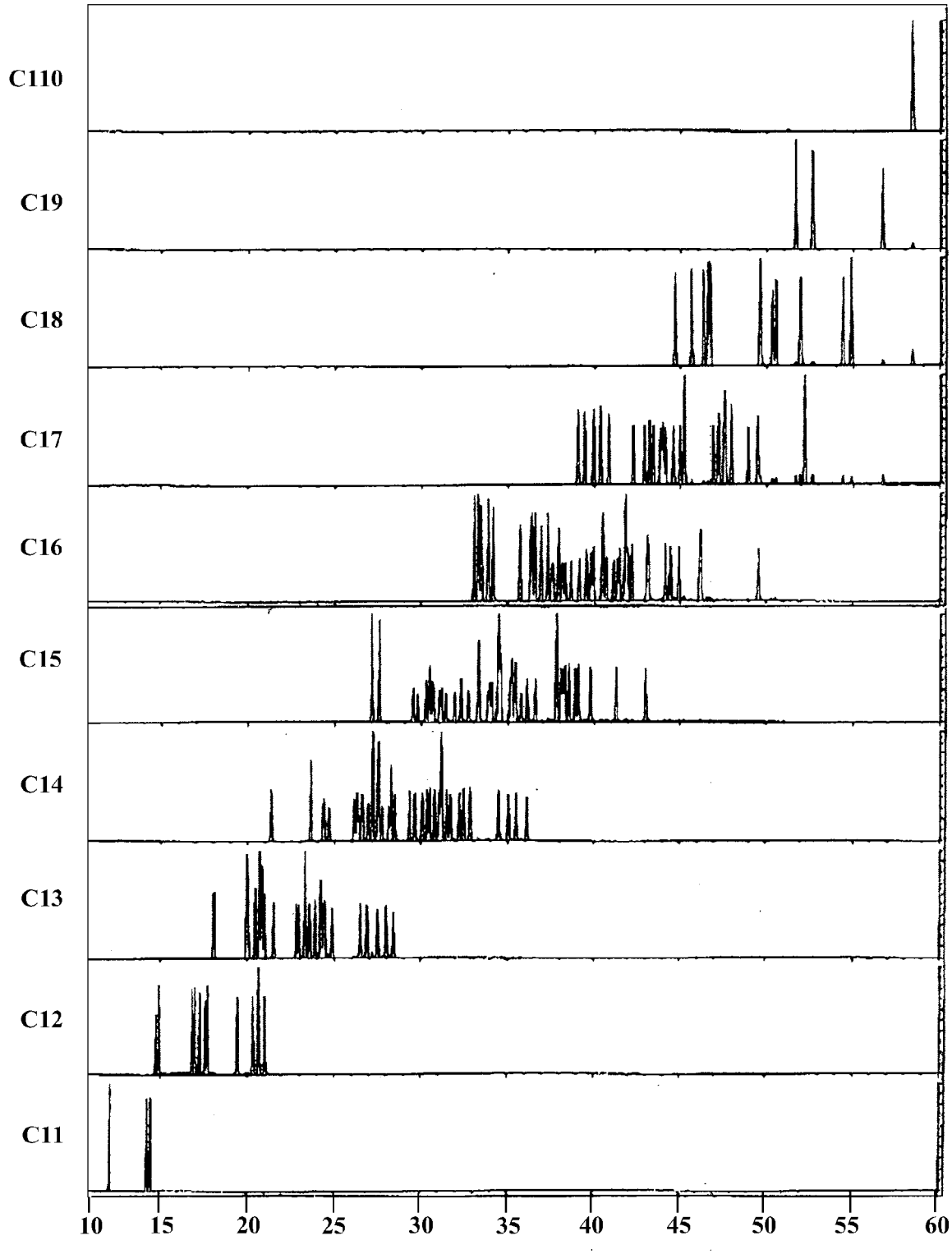

Figure 8 CB congeners at each level of chlorination on the SPB-octyl column

24.0 Glossary

These definitions and purposes are specific to this Method but have been conformed to common usage to the extent possible.

24.1 Units of weight and measure and their abbreviations

24.1.1 Symbols

°C	degrees Celsius
μL	microliter
μm	micrometer
<	less than
>	greater than
%	percent

24.1.2 Alphabetical abbreviations

cm	centimeter
g	gram
h	hour
ID	inside diameter
in.	inch
L	liter
M	Molecular ion
m	meter
mg	milligram
min	minute
mL	milliliter
mm	millimeter
m/z	mass-to-charge ratio
N	normal; gram molecular weight of solute divided by hydrogen equivalent of solute, per liter of solution
OD	outside diameter
pg	picogram
ppb	part-per-billion
ppm	part-per-million
ppq	part-per-quadrillion
ppt	part-per-trillion
psig	pounds-per-square inch gauge
v/v	volume per unit volume
w/v	weight per unit volume

24.2 Definitions and acronyms (in alphabetical order).

Analyte—A CB tested for by this Method. The analytes are listed in Table 1.

Calibration standard (CAL)—A solution prepared from a secondary standard and/or stock solutions and used to calibrate the response of the HRGC/HRMS instrument.

Calibration verification standard (VER)—The mid-point calibration standard (CS-3) that is used to verify calibration. See Table 5.

CB—chlorinated biphenyl congener. One of the 209 individual chlorinated biphenyl congeners determined using this Method. The 209 CBs are listed in Table 1.

CS-0.2, CS-1, CS-2, CS-3, CS-4, CS-5—See Calibration standards and Table 5.

DeCB—decachlorobiphenyl (PCB 209)

DiCB—dichlorobiphenyl

Estimated method detection limit (EMDL)—The lowest concentration at which a CB can be detected with common laboratory interferences present. EMDLs are listed in Table 2.

Estimated minimum level (EML)—The lowest concentration at which a CB can be measured reliably with common laboratory interferences present. EMLs are listed in Table 2.

Field blank—An aliquot of reagent water or other reference matrix that is placed in a sample container in the laboratory or the field, and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the field blank is to determine if the field or sample transporting procedures and environments have contaminated the sample.

GC—Gas chromatograph or gas chromatography

GPC—Gel permeation chromatograph or gel permeation chromatography

HpCB—heptachlorobiphenyl

HPLC—High performance liquid chromatograph or high performance liquid chromatography

HRGC—High resolution GC

HRMS—High resolution MS

HxCB—hexachlorobiphenyl

Labeled injection internal standard—All five, or any one of the five, $^{13}C_{12}$-labeled CB congeners spiked into the concentrated extract immediately prior to injection of an aliquot of the extract into the HRGC/HRMS. The five Labeled injection internal standards in this Method are CBs with IUPAC numbers 9, 52, 101, 138, and 194.

Internal standard—a labeled compound used as a reference for quantitation of other labeled compounds and for quantitation of native CB congeners other than the congener of which it is a labeled analog. See Internal standard quantitation.

Internal standard quantitation—A means of determining the concentration of (1) a naturally occurring (native) compound by reference to a compound other than its labeled analog and (2) a labeled compound by reference to another labeled compound.

IPR—Initial precision and recovery; four aliquots of a reference matrix spiked with the analytes of interest and labeled compounds and analyzed to establish the ability of the laboratory to generate acceptable precision and recovery. An IPR is performed prior to the first time this Method is used and any time the Method or instrumentation is modified.

Isotope dilution quantitation—A means of determining a naturally occurring (native) compound by reference to the same compound in which one or more atoms has been isotopically enriched. In this Method, all 12 carbon atoms in the biphenyl molecule are enriched with carbon-13 to produce $^{13}C_{12}$-labeled analogs of the chlorinated biphenyls. The $^{13}C_{12}$-labeled CBs are spiked into each sample and allow identification and correction of the concentration of the native compounds in the analytical process.

K-D—Kuderna-Danish concentrator; a device used to concentrate the analytes in a solvent

Laboratory blank—See Method blank

Laboratory control sample (LCS)—See Ongoing precision and recovery standard (OPR)

Laboratory reagent blank—See Method blank

May—This action, activity, or procedural step is neither required nor prohibited.

May not—This action, activity, or procedural step is prohibited.

Method blank—An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The Method blank is used to determine if analytes or interferences are present in the laboratory environment, the reagents, or the apparatus.

Minimum level of quantitation (ML)—The level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that all Method-specified sample weights, volumes, and cleanup procedures have been employed.

MoCB—monochlorobiphenyl

MS—Mass spectrometer or mass spectrometry

Must—This action, activity, or procedural step is required.

NoCB-nonachlorobiphenyl

OcCB—octachlorobiphenyl

OPR—Ongoing precision and recovery standard (OPR); a method blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in this Method for precision and recovery.

Perfluorokerosene (PFK)—A mixture of compounds used to calibrate the exact m/z scale in the HRMS.

Preparation blank—See Method blank

Quality control check sample (QCS)—A sample containing all or a subset of the analytes at known concentrations. The QCS is obtained from a source external to the laboratory or is prepared from a source of standards different from the source of calibration standards. It is used to check laboratory performance with test materials prepared external to the normal preparation process.

PeCB—pentachlorobiphenyl

PCB—polychlorinated biphenyl

Reagent water—water demonstrated to be free from the analytes of interest and potentially interfering substances at the method detection limit for the analyte.

Relative standard deviation (RSD)—The standard deviation times 100 divided by the mean. Also termed "coefficient of variation."

RF—Response factor. See Section 10.5

RR—Relative response. See Section 10.4

RSD—See Relative standard deviation

SDS—Soxhlet/Dean-Stark extractor; an extraction device applied to the extraction of solid and semi-solid materials (Reference 11 and Figure 5).

Signal-to-noise ratio (S/N)—The height of the signal as measured from the mean (average) of the noise to the peak maximum divided by the width of the noise.

Should—This action, activity, or procedural step is suggested but not required.

SICP—Selected ion current profile; the line described by the signal at an exact m/z.

SPE—Solid-phase extraction; an extraction technique in which an analyte is extracted from an aqueous sample by passage over or through a material capable of reversibly adsorbing the analyte. Also termed liquid-solid extraction.

Stock solution—A solution containing an analyte that is prepared using a reference material traceable to EPA, the National Institute of Science and Technology (NIST), or a source that will attest to the purity and authenticity of the reference material.

TeCB—tetrachlorobiphenyl

TEF-Toxicity equivalency factor; an estimate of the toxicity of a specific congener relative to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.

TEQ—the toxicity equivalent concentration in an environmental sample. It is the sum of the concentrations of each individual toxic PCB and each individual 2,3,7,8-substituted, tetra-through octachlorinated, dibenzo-p-dioxin and dibenzofuran multiplied by their respective TEFs (Reference 1).

TEQ_{PCB}—the portion of the TEQ attributable to the toxic PCBs.

TrCB—trichlorobiphenyl

Unique GC resolution or uniquely resolved—Two adjacent chromatographic peaks in which the height of the valley is less than 40 percent of the height of the shorter peak (See section 6.9.1.1.2 and Figures 6 and 7 for unique resolution specific to the SPB-octyl column).

VER—See Calibration verification.

Annex A - Preliminary information for determination of 209 CBs on the DB-1 column

1 Column and Conditions

1.1 Column—30±5-m long x 0.25±0.02-mm ID; 0.25-μm film DB-1 (J&W, or equivalent).

1.2 Suggested GC operating conditions:

Injector temperature:	270 °C
Interface temperature:	290 °C
Initial temperature:	75 °C
Initial time:	2 minutes
Temperature program:	75-150 °C @ 15 °C/minute
	150-270 °C @ 2.5 °C/minute
Final time:	7 minutes
Carrier gas velocity:	40 cm/sec @ 200 °C

Note: *The GC conditions may be optimized for compound separation and sensitivity. Once optimized, the same GC conditions must be used for the analysis of all standards, blanks, IPR and OPR aliquots, and samples.*

2 Operating information

2.1 Congener solutions—Mixes of individual congeners that will allow separation of all 209 congeners on the DB-1 column had not been developed at the date of writing of Revision A to Method 1668.

2.2 Elution order data—The congener mixes developed for the SPB-octyl column (Table 4 of Method 1668) were run on the DB-1 column. Although some congeners in these mixes co-elute on the DB-1 column, the mixes allow determination of retention times the DB-1 column. These retention times are shown in Annex Table A-1

2.2 Window-defining congeners—The beginning and ending congeners at each level of chlorination are the same as those for the SPB-octyl column. See Table 2 in Method 1668.

2.3 Scan descriptors—The 6-function scan descriptors are shown in Annex Table A-2

Table A-1. Retention time (RT) references, quantitation references, relative retention times (RRTs), estimated detection limits (EMDLs), and estimated minimum levels (EMLs) for CB congeners using a DB-1 column.

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
$^{13}C_{12}$-2-MoCB[4]	1L	$^{13}C_{12}$-4-MoCB[4,5]	3L	09:17	0.8855	0.8776-0.8935
2-MoCB	1	$^{13}C_{12}$-2-MoCB[4]	1L	09:17	1.0000	0.9964-1.0072
3-MoCB	2	$^{13}C_{12}$-4-MoCB[4,5]	3L	10:22	0.9889	0.9809-0.9968
$^{13}C_{12}$-4-MoCB[4,5]	3L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	10:29	0.5561	0.5473-0.5650
4-MoCB	3	$^{13}C_{12}$-4-MoCB[4,5]	3L	10:29	1.0000	0.9968-1.0064
$^{13}C_{12}$-2,2'-DiCB[4]	4L	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	11:08	0.7591	0.7477-0.7705
2,2'-DiCB	4	$^{13}C_{12}$-2,2'-DiCB[4]	4L	11:08	1.0000	0.9925-1.0075
2,6-DiCB	10	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	11:10	0.7614	0.7500-0.7727
2,5-DiCB	9	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	12:08	0.8273	0.8216-0.8330
2,4-DiCB	7	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	12:09	0.8284	0.8227-0.8341
2,3'-DiCB	6	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	12:31	0.8534	0.8477-0.8591
2,4'-DiCB[6]	8	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	12:43	0.8670	0.8614-0.8727
2,3-DiCB	5	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	12:46	0.8705	0.8648-0.8761
$^{13}C_{12}$-2,2',6-TrCB[4]	19L	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	13:31	0.7990	0.7892-0.8089
2,2',6-TrCB	19	$^{13}C_{12}$-2,2',6-TrCB[4]	19L	13:31	1.0000	0.9975-1.0049
3,5-DiCB	14	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	13:36	0.9273	0.9216-0.9330
2,4,6-TrCB	30	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	14:06	0.8335	0.8286-0.8384
3,3'-DiCB	11	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	14:11	0.9670	0.9614-0.9727
3,4'-DiCB	13	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	14:26	0.9841	0.9784-0.9898
3,4-DiCB	12	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	14:27	0.9852	0.9795-0.9909
2,2',5-TrCB[6]	18	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	14:36	0.8631	0.8581-0.8680
$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	14:40	0.7781	0.7692-0.7869
4,4'-DiCB	15	$^{13}C_{12}$-4,4'-DiCB[4,5]	15L	14:40	1.0000	0.9977-1.0043
2,2',4-TrCB	17	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	14:43	0.8700	0.8650-0.8749
2,3',6-TrCB	27	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	15:06	0.8926	0.8877-0.8975

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,3,6-TrCB	24	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	15:06	0.8926	0.8877-0.8975
2,2',3-TrCB	16	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	15:26	0.9123	0.9074-0.9172
2,4',6-TrCB	32	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	15:29	0.9153	0.9103-0.9202
$^{13}C_{12}$-2,2',6,6'-TeCB[4]	54L	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	16:02	0.6139	0.6075-0.6203
2,2',6,6'-TeCB	54	$^{13}C_{12}$-2,2',6,6'-TeCB[4]	54L	16:02	1.0000	0.9979-1.0042
2',3,5-TrCB	34	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:03	0.9488	0.9438-0.9537
2,3,5-TrCB	23	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:07	0.9527	0.9478-0.9576
2,4,5-TrCB	29	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:18	0.9635	0.9586-0.9685
2,3',5-TrCB	26	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:29	0.9744	0.9695-0.9793
2,3',4-TrCB	25	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:36	0.9813	0.9764-0.9862
2,4',5-TrCB	31	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:52	0.9970	0.9921-1.0020
$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	16:55	0.8974	0.8930-0.9019
2,4,4'-TrCB[6]	28	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	16:55	1.0000	0.9980-1.0039
2,2',4,6-TeCB	50	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	16:55	0.6477	0.6414-0.6541
2,3,4-TrCB	21	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	17:21	1.0256	1.0207-1.0305
2,2',5,6'-TeCB	53	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	17:26	0.6675	0.6611-0.6739
2,3,3'-TrCB	20	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	17:22	1.0266	1.0217-1.0315
2',3,4-TrCB	33	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	17:24	1.0286	1.0236-1.0335
2,2',4,6'-TeCB	51	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	17:42	0.6777	0.6713-0.6841
2,3,4'-TrCB	22	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	17:43	1.0473	1.0424-1.0522
2,2',3,6-TeCB	45	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	18:00	0.6892	0.6828-0.6956
3,3',5-TrCB	36	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	18:16	1.0798	1.0749-1.0847
2,2',3,6'-TeCB	46	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	18:24	0.7045	0.6981-0.7109
3,4',5-TrCB	39	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	18:37	1.1005	1.0956-1.1054
$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	18:51	1.0000	0.9956-1.0044
2,2',5,5'-TeCB[6]	52	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	18:51	0.7218	0.7154-0.7281
2,3',4,6-TeCB	69	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	18:52	0.7224	0.7160-0.7288
2,3',5',6-TeCB	73	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	18:57	0.7256	0.7192-0.7320

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,2',4,5'-TeCB	49	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:00	0.7275	0.7211-0.7339
2,2',3,5-TeCB	43	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:04	0.7301	0.7237-0.7364
3,4,5-TrCB	38	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	19:12	1.1350	1.1300-1.1399
2,2',4,4'-TeCB	47	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:15	0.7371	0.7307-0.7435
2,4,4',6-TeCB	75	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:20	0.7403	0.7339-0.7466
2,2',4,5-TeCB	48	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:20	0.7403	0.7339-0.7466
2,3,5,6-TeCB	65	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:31	0.7473	0.7409-0.7537
2,3,4,6-TeCB	62	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:36	0.7505	0.7441-0.7569
3,3',4-TrCB	35	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	19:41	1.1635	1.1586-1.1685
$^{13}C_{12}$-2,2',4,6,6'-PeCB[4]	104L	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	19:45	0.7037	0.6977-0.7096
2,2',4,6,6'-PeCB	104	$^{13}C_{12}$-2,2',4,6,6'-PeCB[4]	104L	19:45	1.0000	0.9983-1.0034
2,2',3,5'-TeCB[6]	44	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	19:55	0.7626	0.7562-0.7690
$^{13}C_{12}$-3,4,4'-TrCB[4]	37L	$^{13}C_{12}$-2,4,4'-TrCB[5]	28L	20:03	1.1852	1.1803-1.1901
3,4,4'-TrCB	37	$^{13}C_{12}$-3,4,4'-TrCB[4]	37L	20:03	1.0000	0.9983-1.0033
2,3,3',6-TeCB	59	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:05	0.7690	0.7626-0.7754
2,2',3,4'-TeCB	42	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:07	0.7703	0.7639-0.7766
2,3',5,5'-TeCB	72	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:36	0.7888	0.7824-0.7951
2,3',4',6-TeCB	71	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:36	0.7888	0.7824-0.7951
2,3,4',6-TeCB	64	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:37	0.7894	0.7830-0.7958
2,2',3,4-TeCB	41	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:39	0.7907	0.7843-0.7971
2,2',3,6,6'-PeCB	96	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	20:48	0.7411	0.7352-0.7470
2,3',4,5'-TeCB	68	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:52	0.7990	0.7926-0.8054
2,2',3,3'-TeCB	40	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	20:58	0.8028	0.7996-0.8060
2,3,3',5-TeCB	57	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	21:21	0.8175	0.8143-0.8207
2,2',4,5,'6-PeCB	103	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	21:22	0.7613	0.7553-0.7672
2,3',4,5-TeCB	67	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	21:38	0.8283	0.8251-0.8315
2,2',4,4',6-PeCB	100	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	21:41	0.7726	0.7666-0.7785
2,3,3',5'-TeCB	58	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	21:43	0.8315	0.8283-0.8347

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,3,4',5-TeCB	63	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	21:51	0.8366	0.8334-0.8398
2,2',3,5,6'-PeCB	94	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:05	0.7868	0.7809-0.7928
2,4,4',5-TeCB	74	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:07	0.8468	0.8437-0.8500
2,3,4,5-TeCB	61	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:11	0.8494	0.8462-0.8526
2,3',4',5-TeCB	70	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:20	0.8551	0.8519-0.8583
2',3,4,5-TeCB	76	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:25	0.8583	0.8551-0.8615
2,2',3',4,6-PeCB	98	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:28	0.8005	0.7975-0.8034
2,3',4,4'-TeCB[6]	66	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:29	0.8609	0.8577-0.8641
2,2',4,5,6'-PeCB	102	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:32	0.8029	0.7999-0.8058
2,2',3,5',6-PeCB	95	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:34	0.8040	0.8011-0.8070
2,2',3,5,6-PeCB	93	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:36	0.8052	0.8023-0.8082
3,3',5,5'-TeCB	80	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:45	0.8711	0.8679-0.8743
2,2',3,4,6-PeCB	88	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:49	0.8129	0.8100-0.8159
2,2',3,4',6-PeCB	91	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	22:55	0.8165	0.8135-0.8195
2,3,3',4'-TeCB	55	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	22:57	0.8787	0.8756-0.8819
2,3',4,5,'6-PeCB	121	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	23:04	0.8219	0.8189-0.8248
2,3,3',4'-TeCB	56	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	23:24	0.8960	0.8928-0.8992
2,3,4,4'-TeCB	60	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	23:24	0.8960	0.8928-0.8992
$^{13}C_{12}$-2,2',4,4',6,6'-HxCB[4]	155L	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	23:43	0.7104	0.7054-0.7154
2,2',4,4',6,6'-HxCB	155	$^{13}C_{12}$-2,2',4,4',6,6'-HxCB[4]	155L	23:43	1.0000	0.9986-1.0028
2,2',3,3',6-PeCB	84	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	23:44	0.8456	0.8426-0.8486
2,2',3,5,5'-PeCB	92	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	23:50	0.8492	0.8462-0.8521
2,2',3,4,6'-PeCB	89	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	23:53	0.8510	0.8480-0.8539
2,2',3,4',5-PeCB	90	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	24:07	0.8593	0.8563-0.8622
$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	24:11	1.0000	0.9966-1.0034
2,2',4,5,5'-PeCB[6]	101	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	24:11	0.8616	0.8587-0.8646
2,3,3',5',6-PeCB	113	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	24:23	0.8688	0.8658-0.8717
3,3',4,5'-TeCB	79	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	24:27	0.9362	0.9330-0.9394

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,2',4,4',5-PeCB	99	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	24:28	0.8717	0.8688-0.8747
2,2',3,4',6,6'-HxCB	150	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	24:52	0.7449	0.7399-0.7499
2,3',4,4',6-PeCB	119	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	24:54	0.8872	0.8842-0.8901
2,3,3',5,6-PeCB	112	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:00	0.8907	0.8878-0.8937
2,3,3',4,5'-PeCB	108	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:09	0.8961	0.8931-0.8990
2,2',3,5,6,6'-HxCB	152	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	25:17	0.7574	0.7524-0.7624
2,2',3,3',5-PeCB	83	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:20	0.8919	0.8890-0.8949
2,2',3',4,5-PeCB	97	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:22	0.9038	0.9008-0.9068
2,2',3,4,5-PeCB	86	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:27	0.9068	0.9038-0.9097
$^{13}C_{12}$-3,4,4',5-TeCB[9]	81L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	25:32	1.3546	1.3457-1.3634
3,4,4',5-TeCB[10]	81	$^{13}C_{12}$-3,4,4',5-TeCB[4,5,9]	77L	25:32	1.0000	0.9987-1.0026
2',3,4,5,6'-PeCB	125	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:36	0.9121	0.9091-0.9151
2,3,4',5,6-PeCB	117	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:37	0.9127	0.9097-0.9157
2,2',3,4,5'-PeCB	87	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:38	0.9133	0.9103-0.9163
3,3',4,5-TeCB	78	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	25:40	0.9598	0.9566-0.9630
2,2',3,4,6,6'-HxCB	145	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	25:42	0.7698	0.7649-0.7748
2,3,4,4',6-PeCB	115	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:44	0.9169	0.9139-0.9198
$^{13}C_{12}$-2,3,3',5,5'-PeCB[8]	111L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	25:51	1.0689	1.0655-1.0724
2,3,3',5,5'-PeCB	111	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:51	0.9210	0.9181-0.9240
2,2',3,4,4'-PeCB	85	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:51	0.9210	0.9181-0.9240
2,3,4,5,6-PeCB	116	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	25:48	0.9192	0.9163-0.9222
$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	$^{13}C_{12}$-2,2',5,5'-TeCB[7]	52L	26:07	1.3855	1.3767-1.3943
3,3',4,4'-TeCB[6,10]	77	$^{13}C_{12}$-3,3',4,4'-TeCB[4,5,9]	77L	26:07	1.0000	0.9987-1.0026
2,2',3,3',6,6'-HxCB	136	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	26:10	0.7793	0.7743-0.7843
2,3',4,5,5'-PeCB	120	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	26:12	0.9335	0.9305-0.9365
2,2',3,4',5,6'-HxCB	148	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	26:14	0.7858	0.7808-0.7908
2,3,3',4',6-PeCB	110	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	26:16	0.9359	0.9329-0.9388
2,2',4,4',5,6'-HxCB	154	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	26:44	0.8008	0.7983-0.8033

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,2',3,3',4-PeCB	82	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	26:48	0.9549	0.9519-0.9578
2,2',3,5,5',6-HxCB	151	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	27:18	0.8178	0.8153-0.8203
2,2',3,3',5,6'-HxCB	135	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	27:31	0.8243	0.8218-0.8268
2',3,4,5,5'-PeCB	124	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	27:36	0.9834	0.9804-0.9863
2,2',3,4,5',6-HxCB	144	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	27:38	0.8278	0.8253-0.8303
2,3,3',4',5-PeCB	107	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	27:40	0.9857	0.9828-0.9887
2,2',3,4',5,6-HxCB	147	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	27:44	0.8308	0.8283-0.8333
2,3,3',4,6-PeCB	109	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	27:45	0.9887	0.9857-0.9917
2,2',3,4',5',6-HxCB	149	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:01	0.8392	0.8367-0.8417
2,2',3,3',5,6-HxCB	134	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:35	0.8562	0.8537-0.8587
2,2',3,4,5,6'-HxCB	143	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:34	0.8557	0.8532-0.8582
$^{13}C_{12}$-2',3,4,4',5-PeCB[9]	123L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	27:53	1.1530	1.1496-1.1564
2',3,4,4',5-PeCB[10]	123	$^{13}C_{12}$-2',3,4,4',5-PeCB[9]	123L	27:53	1.0000	0.9988-1.0024
2,2',3,4,4',6-HxCB	139	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:01	0.8392	0.8367-0.8417
2,3,3',4,5-PeCB	106	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	28:04	1.0000	0.9970-1.0030
$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	28:04	1.1606	1.1571-1.1640
2,3',4,4',5-PeCB[6,10]	118	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	28:04	1.0000	0.9988-1.0024
2,2',3,4,4',6'-HxCB	140	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:12	0.8447	0.8422-0.8472
$^{13}C_{12}$-2,3,4,4',5-PeCB[9]	114L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	28:38	1.1840	1.1806-1.1875
2,3,4,4',5-PeCB[10]	114	$^{13}C_{12}$-2,3,4,4',5-PeCB[9]	114L	28:38	1.0000	0.9988-1.0023
2',3,3',4,5-PeCB	122	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	28:48	1.0261	1.0232-1.0291
2,2',3,3',4,6-HxCB	131	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:52	0.8647	0.8622-0.8672
2,2',3,4,5,6-HxCB	142	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:59	0.8682	0.8657-0.8707
2,2',3,3',5,5'-HxCB	133	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	28:59	0.8682	0.8657-0.8707
2,2',3,3',4,6'-HxCB	132	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:32	0.8847	0.8822-0.8872
2,3,3',5,5',6-HxCB	165	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:21	0.8792	0.8767-0.8817
$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB[4]	188L	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	29:22	0.9511	0.7327-0.7411
2,2',3,4',5,6,6'-HpCB	188	$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB[4]	188L	29:22	1.0000	0.9989-1.0023

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,2',3,4',5,5'-HxCB	146	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:24	0.8807	0.8782-0.8832
$^{13}C_{12}$-2,3,3',4,4'-PeCB[9]	105L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	29:30	1.2198	1.2130-1.2267
2,3,3',4,4'-PeCB[6,10]	105	$^{13}C_{12}$-2,3,3',4,4'-PeCB[9]	105L	29:30	1.0000	0.9989-1.0023
2,3,3',4,5',6-HxCB	161	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:32	0.8847	0.8822-0.8872
2,2',4,4',5,5'-HxCB[6]	153	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:48	0.8927	0.8902-0.8952
2,2',3,4,4',6,6'-HpCB	184	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	29:49	0.7482	0.7440-0.7524
3,3',4,5,5'-PeCB	127	$^{13}C_{12}$-2,3',4,4',5-PeCB[5,9]	118L	29:57	1.0671	1.0641-1.0701
2,3',4,4',5',6-HxCB	168	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	29:59	0.8982	0.8957-0.9006
2,2',3,4,5,5'-HxCB	141	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	30:31	0.9141	0.9116-0.9166
2,2',3,3',5,6,6'-HpCB	179	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	30:33	0.7666	0.7624-0.7708
2,2',3,4,4',5-HxCB	137	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	30:51	0.9241	0.9216-0.9266
2,2',3,3',4,5'-HxCB	130	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	30:57	0.9271	0.9246-0.9296
2,2',3,3',4,6,6'-HpCB	176	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	31:01	0.7783	0.7742-0.7825
$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	31:20	1.0000	0.9973-1.0027
2,2',3,4,4',5'-HxCB[6]	138	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:20	0.9386	0.9361-0.9411
2,3,3',4',5',6-HxCB	164	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:22	0.9396	0.9371-0.9421
2,3,3',4',5,6-HxCB	163	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:28	0.9426	0.9401-0.9451
2,3,3',4,5,6-HxCB	160	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:33	0.9451	0.9426-0.9476
2,3,3',4,4',6-HxCB	158	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:35	0.9461	0.9436-0.9486
2,2',3,4,5,6,6'-HpCB	186	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	31:36	0.7930	0.7888-0.7972
2,2',3,3',4,5-HxCB	129	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	31:48	0.9526	0.9501-0.9551
$^{13}C_{12}$-3,3',4,4',5-PeCB[4,9]	126L	$^{13}C_{12}$-2,2',4,5,5'-PeCB[7]	101L	31:49	1.3156	1.3088-1.3225
3,3',4,4',5-PeCB[6,10]	126	$^{13}C_{12}$-3,3',4,4',5-PeCB[4,9]	126L	31:49	1.0000	0.9990-1.0021
2,3,4,4',5,6-HxCB	166	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	32:13	0.9651	0.9626-0.9675
$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	32:14	1.0000	0.9974-1.0026
2,2',3,3',5,5',6-HpCB	178	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	32:14	0.8089	0.8068-0.8110
2,2',3,3',4,5',6-HpCB	175	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	32:33	0.8168	0.8147-0.8189
2,3,3',4,5,5'-HxCB	159	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	32:43	0.9800	0.9775-0.9825

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
2,2',3,4',5,5',6-HpCB[6]	187	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	32:46	0.8223	0.8202-0.8243
2,2',3,4,4',5,6'-HpCB	182	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	32:47	0.8227	0.8206-0.8248
2,2',3,3',4,4'-HxCB[6]	128	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	32:52	0.9845	0.9820-0.9870
2,3,3',4',5,5'-HxCB	162	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	33:00	0.9885	0.9860-0.9910
2,2',3,4,4',5',6-HpCB	183	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	33:06	0.8306	0.8285-0.8327
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	33:23	1.0654	1.0628-1.0681
2,3',4,4',5,5'-HxCB[10]	167	$^{13}C_{12}$-2,3',4,4',5,5'-HxCB[5,9]	167L	33:23	1.0000	0.9990-1.0020
2,2',3,4,5,5',6-HpCB	185	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	33:43	0.8461	0.8440-0.8482
2,2',3,3',4,5,6'-HpCB	174	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	34:07	0.8561	0.8540-0.8582
2,2',3,4,4',5,6-HpCB	181	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	34:11	0.8578	0.8557-0.8599
2,2',3,3',4',5,6-HpCB	177	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	34:22	0.8624	0.8603-0.8645
2,2'3,3',4,4',6-HpCB	171	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	34:40	0.8699	0.8678-0.8720
$^{13}C_{12}$-2,3,3',4,4',5 -HxCB[9]	156L	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	34:40	1.1064	1.1037-1.1090
2,3,3',4,4',5-HxCB[10]	156	$^{13}C_{12}$-2,3,3',4,4',5 -HxCB[9]	156L	34:40	1.0000	0.9990-1.0019
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB[4]	202L	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	34:56	0.8265	0.8245-0.8285
2,2',3,3',5,5',6,6'-OcCB	202	$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB[4]	202L	34:56	1.0000	0.9990-1.0019
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB[9]	157L	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	34:57	1.1154	1.1128-1.1181
2,3,3',4,4',5'-HxCB[10]	157	$^{13}C_{12}$-2,3,3',4,4',5'-HxCB[9]	157L	34:57	1.0000	0.9990-1.0019
2,2',3,3',4,5,6-HpCB	173	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	35:04	0.8800	0.8779-0.8821
2,2',3,3',4,5',6,6'-OcCB	201	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	35:25	0.8379	0.8360-0.8399
2,2',3,4,4',5,6,6'-OcCB	204	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	35:36	0.8423	0.8403-0.8442
2,2',3,3',4,5,5'-HpCB	172	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	35:41	0.8954	0.8934-0.8975
2,3,3',4,5,5',6-HpCB	192	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	35:51	0.8996	0.8975-0.9017
2,2',3,3',4,4',6,6'-OcCB	197	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	35:55	0.8498	0.8478-0.8517
2,2',3,4,4',5,5'-HpCB[6]	180	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	36:07	0.9063	0.9042-0.9084
2,3,3',4',5,5',6-HpCB	193	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	36:20	0.9118	0.9097-0.9138
2,3,3',4,4',5',6-HpCB	191	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	36:34	0.9176	0.9155-0.9197
2,2',3,3',4,5,6,6'-OcCB	200	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	36:49	0.8711	0.8691-0.8730

Labeled or native CB[1]	IUPAC number[2]	Retention time and quantitation references	IUPAC number	RT	RRT	RRT QC limits[3]
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB[4,9]	169L	$^{13}C_{12}$-2,2',3,4,4',5'-HxCB[7]	138L	37:19	1.1910	1.1883-1.1936
3,3',4,4',5,5'-HxCB[6,10]	169	$^{13}C_{12}$-3,3',4,4',5,5'-HxCB[4,9]	169L	37:19	1.0000	0.9991-1.0018
2,2',3,3',4,4',5-HpCB[6]	170	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	37:44	0.9469	0.9448-0.9490
2,3,3',4,4',5,6-HpCB	190	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	37:56	0.9519	0.9498-0.9540
2,2',3,3',4,5,5',6-OcCB	198	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	38:34	0.9125	0.9105-0.9144
2,2',3,3',4,5,5',6'-OcCB	199	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	38:43	0.9160	0.9140-0.9180
2,2',3,3',4,4',5,6'-OcCB	196	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	39:05	0.9247	0.9227-0.9267
2,2',3,4,4',5,5',6-OcCB	203	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	39:05	0.9247	0.9227-0.9267
$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	39:51	1.2363	1.2311-1.2415
2,3,3',4,4',5,5'-HpCB[10]	189	$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB[4,5,9]	189L	39:51	1.0000	0.9992-1.0017
2,2',3,3',4,4',5,6-OcCB[6]	195	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	40:45	0.9641	0.9621-0.9661
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-NoCB[4]	208L	$^{13}C_{12}$-Cl9-PCB-206[4,5]	206L	41:03	0.9149	0.9131-0.9168
2,2',3,3',4,5,5',6,6'-NoCB	208	$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-NoCB[4]	208L	41:03	1.0000	0.9992-1.0016
2,2',3,3',4,4',5,6,6'-NoCB	207	$^{13}C_{12}$-Cl9-PCB-206[4,5]	206L	41:32	0.9257	0.9238-0.9276
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-OcCB[5]	194L	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	42:16	1.3113	1.3061-1.3164
2,2',3,3',4,4',5,5'-OcCB	194	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	42:16	1.0000	0.9992-1.0016
$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB[4]	205L	$^{13}C_{12}$-Cl8-PCB-194[5]	194L	42:44	1.0110	1.0091-1.0130
2,3,3',4,4',5,5',6-OcCB	205	$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB[4]	205L	42:44	1.0000	0.9992-1.0016
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB[4,5]	206L	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	44:52	1.3919	1.3868-1.3971
2,2',3,3',4,4',5,5',6-NoCB[6]	206	$^{13}C_{12}$-Cl9-PCB-206[4,5]	206L	44:52	1.0000	0.9993-1.0015
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-DeCB[4,5]	209L	$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB[7]	178L	46:55	1.4555	1.4504-1.4607
2,2',3,3',4,4',5,5',6,6'-DeCB[6]	209	$^{13}C_{12}$-Cl10-PCB-209[4,5]	209L	46:55	1.0000	0.9993-1.0014

1. Abbreviations for chlorination levels
   - MoCB = monochlorobiphenyl
   - DiCB = dichlorobiphenyl
   - TrCB = trichlorobiphenyl
   - TeCB = tetrachlorbiphenyl
   - PeCB = pentachlorobiphenyl
   - HxCB = hexachlorobiphenyl

HpCB = heptachlorobiphenyl
OcCB = octachlorobiphenyl
NoCB = nonachlorobiphenyl
DeCB = decachlorobiphenyl

2. Suffix "L" indicates labeled compound.
3. For native CBs determined by isotope dilution quantitation, RRT QC limits were constructed using -2 to +4 seconds around the the retention time for the labeled analog. For native CBs determined by internal standard quantitation, RRT QC limits were constructed using a ±2 percent window around the retention time for retention times in the range of 0.8-1.2 and a ±4 percent window around the retention time for retention times <0.8 and >1.2. These windows may not be adequate for analyte identification (See the note in Section 16.4)
4. Labeled level of chlorination (LOC) window-defining congener
5. Labeled level of chlorination (LOC) quantitation congener
6. National Oceanic and Atmospheric Administration (NOAA) congener of interest
7. Instrument internal standard
8. Clean-up standard
9. Labeled internal standard for World Health Organization (WHO) toxic congener
10. WHO toxic congener

Table A-2 Scan descriptors, levels of chlorination, m/z information, and substances monitored by HRGC/HRMS

Function and chlorine level	m/z	m/z type	m/z formula	Substance
Fn-1	188.0393	M	$^{12}C_{12}$ H_9 ^{35}Cl	Cl-1 PCB
Cl-1	190.0363	M+2	$^{12}C_{12}$ H_9 ^{37}Cl	Cl-1P CB
	200.0795	M	$^{13}C_{12}$ H_9 ^{35}Cl	$^{13}C_{12}$ Cl-1 PCB
	202.0766	M+2	$^{13}C_{12}$ H_9 ^{37}Cl	$^{13}C_{12}$ Cl-1 PCB
	218.9856	lock	C_4 F_9	PFK
Fn-2	222.0003	M	$^{12}C_{12}$ H_8 $^{35}Cl_2$	Cl-2 PCB
Cl-2,3	223.9974	M+2	$^{12}C_{12}$ H_8 ^{35}Cl ^{37} Cl	Cl-2 PCB
	225.9944	M+4	$^{12}C_{12}$ H_8 $^{37}Cl_2$	Cl-2 PCB
	234.0406	M	$^{13}C_{12}$ H_8 $^{35}Cl_2$	$^{13}C_{12}$ Cl-2 PCB
	236.0376	M+2	$^{13}C_{12}$ H_8 ^{35}Cl ^{37} Cl	$^{13}C_{12}$ Cl-2 PCB
	242.9856	lock	C_6 F_9	PFK
	255.9613	M	$^{12}C_{12}$ H_7 $^{35}Cl_3$	Cl-3 PCB
	257.9584	M+2	$^{12}C_{12}$ H_7 $^{35}Cl_2$ ^{37}Cl	Cl-3 PCB
Fn-3	255.9613	M	$^{12}C_{12}$ H_7 $^{35}Cl_3$	Cl-3 PCB
Cl-3,4,5	257.9584	M+2	$^{12}C_{12}$ H_7 $^{35}Cl_2$ ^{37}Cl	Cl-3 PCB
	259.9554	M+4	$^{12}C_{12}$ H_7 ^{35}Cl $^{37}Cl_2$	Cl-3 PCB
	268.0016	M	$^{13}C_{12}$ H_7 $^{35}Cl_3$	$^{13}C_{12}$ Cl-3 PCB
	269.9986	M+2	$^{13}C_{12}$ H_7 $^{35}Cl_2$ ^{37}Cl	$^{13}C_{12}$ Cl-3 PCB
	280.9825	lock	C_6 F_{11}	PFK
	289.9224	M	$^{12}C_{12}$ H_6 $^{35}Cl_4$	Cl-4 PCB
	291.9194	M+2	$^{12}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	Cl-4 PCB
	293.9165	M+4	$^{12}C_{12}$ H_6 $^{35}Cl_2$ $^{37}Cl_2$	Cl-4 PCB
	301.9626	M	$^{13}C_{12}$ H_6 $^{35}Cl_4$	$^{13}C_{12}$ Cl-4 PCB
	303.9597	M+2	$^{13}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	$^{13}C_{12}$ Cl-4 PCB
	323.8834	M	$^{12}C_{12}$ H_5 $^{35}Cl_5$	Cl-5 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
	325.8804	M+2	$^{12}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	Cl-5 PCB
	337.9207	M+2	$^{13}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
Fn-4	289.9224	M	$^{12}C_{12}$ H_6 $^{35}Cl_4$	Cl-4 PCB
Cl-4,5,6	291.9194	M+2	$^{12}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	Cl-4 PCB
	293.9165	M+4	$^{12}C_{12}$ H_6 $^{35}Cl_2$ $^{37}Cl_2$	Cl-4 PCB
	301.9626	M+2	$^{13}C_{12}$ H_6 $^{35}Cl_3$ ^{37}Cl	$^{13}C_{12}$ Cl-4 PCB
	303.9597	M+4	$^{13}C_{12}$ H_6 $^{35}Cl_2$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-4 PCB
	323.8834	M	$^{12}C_{12}$ H_5 $^{35}Cl_5$	Cl-5 PCB
	325.8804	M+2	$^{12}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	Cl-5 PCB
	330.9792	lock	C_7 F_{15}	PFK
	337.9207	M+2	$^{13}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
	359.8415	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_5$ ^{37}Cl	Cl-6 PCB
	361.8385	M+4	$^{13}C_{12}$ H_4 $^{35}Cl_4$ $^{37}Cl_2$	Cl-6 PCB
	363.8356	M+6	$^{13}C_{12}$ H_4 $^{35}Cl_3$ $^{37}Cl_2$	Cl-6 PCB
	371.8817	M+2	$^{13}C_{12}$ H_4 $^{35}Cl_5$ ^{37}Cl	$^{13}C_{12}$ Cl-6 PCB
	373.8788	M+4	$^{13}C_{12}$ H_4 $^{35}Cl_4$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-6 PCB
Fn-5	323.8834	M	$^{12}C_{12}$ H_5 $^{35}Cl_5$	Cl-5 PCB
Cl-5,6,7,8	325.8804	M+2	$^{12}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	Cl-5 PCB
	327.8775	M+4	$^{12}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	Cl-5 PCB
	337.9207	M+2	$^{13}C_{12}$ H_5 $^{35}Cl_4$ ^{37}Cl	$^{13}C_{12}$ Cl-5 PCB
	339.9178	M+4	$^{13}C_{12}$ H_5 $^{35}Cl_3$ $^{37}Cl_2$	$^{13}C_{12}$ Cl-5 PCB
	354.9792	lock	C_9 F_{13}	PFK
	359.8415	M+2	$^{12}C_{12}$ H_4 $^{35}Cl_5$ ^{37}Cl	Cl-6 PCB
	361.8385	M+4	$^{12}C_{12}$ H_4 $^{35}Cl_4$ $^{37}Cl_2$	Cl-6 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
	363.8356	M+6	$^{12}C_{12}H_4{}^{35}Cl_3{}^{37}Cl_3$	Cl-6 PCB
	371.8817	M+2	$^{13}C_{12}H_4{}^{35}Cl_5{}^{37}Cl$	$^{13}C_{12}$ Cl-6 PCB
	373.8788	M+4	$^{13}C_{12}H_4{}^{35}Cl_4{}^{37}Cl_2$	$^{13}C_{12}$ Cl-6 PCB
	393.8025	M+2	$^{12}C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	Cl-7 PCB
	395.7995	M+4	$^{12}C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	Cl-7 PCB
	397.7966	M+6	$^{12}C_{12}H_3{}^{35}Cl_4{}^{37}Cl_3$	Cl-7 PCB
	405.8428	M+2	$^{13}C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	$^{13}C_{12}$ Cl-7 PCB
	407.8398	M+4	$^{13}C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	$^{13}C_{12}$ Cl-7 PCB
	427.7635	M+2	$^{12}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Cl-8 PCB
	429.7606	M+4	$^{12}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Cl-8 PCB
	431.7576	M+6	$^{12}C_{12}H_2{}^{35}Cl_5{}^{37}Cl_3$	Cl-8 PCB
	439.8038	M+2	$^{13}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	$^{13}C_{12}$ Cl-8 PCB
	441.8008	M+4	$^{13}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	$^{13}C_{12}$ Cl-8 PCB
	454.9728	QC	$C_{11}F_{17}$	PFK
Fn-6	427.7635	M+2	$^{12}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Cl-8 PCB
Cl-8,9,10	429.7606	M+4	$^{12}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Cl-8 PCB
	431.7576	M+6	$^{12}C_{12}H_2{}^{35}Cl_5{}^{37}Cl_3$	Cl-8 PCB
	439.8038	M+2	$^{13}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	$^{13}C_{12}$ Cl-8 PCB
	441.8008	M+4	$^{13}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	$^{13}C_{12}$ Cl-8 PCB
	442.9728	QC	$C_{10}F_{13}$	PFK
	454.9728	lock	$C_{11}F_{13}$	PFK
	461.7246	M+2	$^{12}C_{12}H_1{}^{35}Cl_8{}^{37}Cl$	Cl-9 PCB
	463.7216	M+4	$^{12}C_{12}H_1{}^{35}Cl_7{}^{37}Cl_2$	Cl-9 PCB
	465.7187	M+6	$^{12}C_{12}H_1{}^{35}Cl_6{}^{37}Cl_3$	Cl-9 PCB
	473.7648	M+2	$^{13}C_{12}H_1{}^{35}Cl_8{}^{37}Cl$	$^{13}C_{12}$ Cl-9 PCB
	475.7619	M+4	$^{13}C_{12}H_1{}^{35}Cl_7{}^{37}Cl_2$	$^{13}C_{12}$ Cl-9 PCB
	495.6856	M+2	$^{13}C_{12}H_4{}^{35}Cl_9{}^{37}Cl$	Cl-10 PCB
	499.6797	M+4	$^{12}C_{12}{}^{35}Cl_7{}^{37}Cl_3$	Cl-10 PCB

Function and chlorine level	m/z	m/z type	m/z formula	Substance
	501.6767	M+6	$^{12}C_{12}\ ^{35}Cl_6\ ^{37}Cl_4$	Cl-10 PCB
	507.7258	M+2	$^{13}C_{12}\ H_4\ ^{35}Cl_9\ ^{37}Cl$	$^{13}C_{12}$ Cl-10 PCB
	509.7229	M+4	$^{13}C_{12}\ H_4\ ^{35}Cl_8\ ^{37}Cl_2$	$^{13}C_{12}$ Cl-10 PCB
	511.7199	M+6	$^{13}C_{12}\ H_4\ ^{35}Cl_8\ ^{37}Cl_4$	$^{13}C_{12}$ Cl-10 PCB

1. Isotopic masses used for accurate mass calculation

^{1}H	1.0078
^{12}C	12.0000
^{13}C	13.0034
^{35}Cl	34.9689
^{37}Cl	36.9659
^{19}F	18.9984

APPENDIX B

SAMPLE REPORTING FORMS

The sample reporting forms presented in this appendix were generated from the database. They include all revised results or detection limits, validation qualifiers, qualifier codes, and bias codes assigned during validation. The forms have been generated such that there is one page summarizing the results for each "class" of PCBs for each sample (i.e. sample results for one sample are presented on 3 pages). The first page lists the results for the 13 PCBs that are considered to be dioxin-like. The second page lists the results for the homolog groups and the total PCBs. The third page lists the results for the PCBs that are considered to be environmentally relevant, including eight of the dioxin-like PCBs.

During the data validation process, the data reviewer annotated on the analytical data sheets data validation qualifiers ("U", "J", "UJ", and "R") and associated qualifier and bias codes as listed in Table B-1. The purpose of the qualifier codes is to provide information with regard to the data quality condition(s) that resulted in the assigned qualifiers. The bias code provides an indication of the bias direction of the results qualified as estimated based on data quality condition(s) that resulted in the data qualification and the results of the other associated quality control analyses. The data qualifier codes are followed by a hyphen and the applicable bias code. For example, a result qualified as estimated due to a holding time exceedance, which resulted in a potential low bias in the result, has the following code annotated on the data sheet, "HT-L". In the case of multiple data quality conditions resulting in qualification, each qualifier code is listed and separated by a comma. For example, a result qualified as estimated due to low matrix spike recovery and poor method duplicate precision would have the following codes annotated on the data sheet, "MS, MD – I". The analytical results with assigned data qualifiers, qualifier codes, and bias codes are included in this Appendix B.

The forms were generated from the database. They include all revised results or detection limits, validation qualifiers, qualifier codes, and bias codes assigned during validation. The forms have been generated such that there is one page summarizing the results for each "class" of PCBs for each sample (i.e. sample results for one sample are presented on 3 pages). The first page lists the results for the 13 PCBs that are considered to be dioxin-like. The second page lists the results for the homolog groups and the total PCBs. The third page lists the results for the PCBs that are considered to be environmentally relevant, including eight of the dioxin-like PCBs.

Table B-1
DATA VALIDATION QUALIFIER CODES AND BIAS DIRECTION CODES

Qualifier Code	Data Quality Condition Resulting In Assigned Qualification
general use	
HT	Holding time requirement was not met
T	Temperature requirement not met
P	Preservation requirements not met
HS	Sample received with headspace
MB or PB	Method blank or preparation blank contamination
LCS	Laboratory control sample evaluation criteria not met
FB	Field blank contamination
RB	Rinsate blank contamination
FD	Field duplicate evaluation criteria not met
RL	Reporting Limit exceeds decision criterion (for nondetects)
organic methods	
R	Resolution criteria not met
TUNE	Instrument performance (tuning) criteria not met
ICAL	Initial calibration evaluation criteria not met
CCAL	Continuing calibration evaluation criteria not met
ID	Target compound identification criteria not met due to ion ratio (IR) or no confirmation (NC)
SUR	Surrogate recovery outside acceptance range
MS	Matrix spike accuracy criteria not met
MD	Method duplicate precision criteria not met
EMPC(C)	Estimated maximum possible concentration due to co-elution with one or more congeners
IS	Internal standard evaluation criteria not met
Bias Codes	**Bias Direction**
H	Bias in sample result likely to be high
L	Bias in sample result likely to be low
I	Bias in sample result is indeterminate

Sample Results

Sample FS-01-VS-R

Fish: Vermilion Snapper

Lab ID L2767-1

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.03	pg/g	0.99		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	115	pg/g	2.4		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.52	pg/g	2.28		
118 - 2,3',4,4',5-Pentachlorobiphenyl	318	pg/g	2.31		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.46	pg/g	2.53		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.37	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	56.2	pg/g	0.673		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	16.6	pg/g	0.617		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	24.5	pg/g	0.887		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.88	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	65.4	pg/g	0.261	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	197	pg/g	0.237	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.62	pg/g	0.301		

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Sample Results

Sample FS-01-VS-R

Lab ID L2767-1

Fish: Vermilion Snapper

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.617	U	RB-I
Total Dichlorobiphenyls	15.3	pg/g	0.69		
Total Trichlorobiphenyls	69.4	pg/g	0.237		
Total Tetrachlorobiphenyls	323	pg/g	1.01		
Total Pentachlorobiphenyls	1490	pg/g	2.68		
Total Hexachlorobiphenyls	2300	pg/g	1.51		
Total Heptachlorobiphenyls	803	pg/g	0.351		
Total Octachlorobiphenyls	345	pg/g	0.281		
Total Nonachlorobiphenyls	111	pg/g	0.246		
209 - Decachlorobiphenyl	9.54	pg/g	0.195		
Total Polychlorinated Biphenyls	5470	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-VS-R Fish: Vermilion Snapper

Lab ID L2767-1 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.55	pg/g	0.473		
18 - 2,2',5-Trichlorobiphenyl	7.85	pg/g	0.187	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	19.3	pg/g	0.156	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	42.8	pg/g	0.206	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	28.9	pg/g	0.161	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	57.1	pg/g	0.177		
66 - 2,3',4,4'-Tetrachlorobiphenyl	40.2	pg/g	0.826		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.03	pg/g	0.99		
87 - 2,2',3,4,5-Pentachlorobiphenyl	140	pg/g	0.411	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	256	pg/g	0.345	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	115	pg/g	2.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	318	pg/g	2.31		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.37	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	97	pg/g	1.19	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	610	pg/g	1.16	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	738	pg/g	1.02	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	56.2	pg/g	0.673		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.88	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	65.4	pg/g	0.261	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	197	pg/g	0.237	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	76.6	pg/g	0.319	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.28	pg/g	0.231		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	208	pg/g	0.222		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.47	pg/g	0.256		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	70.4	pg/g	0.246		
209 - Decachlorobiphenyl	9.54	pg/g	0.195		

SLC
10-8-01

Sample Results

Sample FS-02-VS-R

Fish: Vermilion Snapper

Lab ID L2767-2

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	15.6	pg/g	2.33		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	240	pg/g	3.26		
114 - 2,3,4,4',5-Pentachlorobiphenyl	11.3	pg/g	3.15		
118 - 2,3',4,4',5-Pentachlorobiphenyl	758	pg/g	2.87		
123 - 2',3,4,4',5-Pentachlorobiphenyl	13.7	pg/g	3.23		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.75	pg/g	3.26		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	108	pg/g	0.53		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	27	pg/g	0.486		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	52.3	pg/g	1.26		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.49	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	179	pg/g	0.328	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	643	pg/g	0.297	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	9.66	pg/g	0.508		

JLC 10-8-01

Sample Results

Sample FS-02-VS-R

Fish: Vermilion Snapper

Lab ID L2767-2

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.728	U	RB-I
Total Dichlorobiphenyls	13.9	pg/g	0.738		
Total Trichlorobiphenyls	167	pg/g	0.315		
Total Tetrachlorobiphenyls	1260	pg/g	2.34		
Total Pentachlorobiphenyls	4040	pg/g	3.52		
Total Hexachlorobiphenyls	5740	pg/g	2.41		
Total Heptachlorobiphenyls	2100	pg/g	0.508		
Total Octachlorobiphenyls	458	pg/g	0.361		
Total Nonachlorobiphenyls	193	pg/g	0.251		
209 - Decachlorobiphenyl	41.3	pg/g	0.146		
Total Polychlorinated Biphenyls	14000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-02-VS-R Fish: Vermilion Snapper

Lab ID L2767-2 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.69	pg/g	0.497		
18 - 2,2',5-Trichlorobiphenyl	12.5	pg/g	0.25	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	48	pg/g	0.156	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	161	pg/g	0.27	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	122	pg/g	0.211	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	204	pg/g	0.233		
66 - 2,3',4,4'-Tetrachlorobiphenyl	176	pg/g	1.92		
77 - 3,3',4,4'-Tetrachlorobiphenyl	15.6	pg/g	2.33		
87 - 2,2',3,4,5-Pentachlorobiphenyl	365	pg/g	0.5	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	785	pg/g	0.419	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	240	pg/g	3.26		
118 - 2,3',4,4',5-Pentachlorobiphenyl	758	pg/g	2.87		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.75	pg/g	3.26		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	184	pg/g	1.89	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1450	pg/g	1.85	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2000	pg/g	1.62	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	108	pg/g	0.53		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.49	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	179	pg/g	0.328	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	643	pg/g	0.297	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	239	pg/g	0.4	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.07	pg/g	0.29		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	451	pg/g	0.278		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	23.5	pg/g	0.35		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	130	pg/g	0.251		
209 - Decachlorobiphenyl	41.3	pg/g	0.146		

SLC
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Sample Results

Sample FS-05-VS-R

Fish: Vermilion Snapper

Lab ID L2767-3R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.62	pg/g	0.491		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	130	pg/g	2.17		
114 - 2,3,4,4',5-Pentachlorobiphenyl	7.19	pg/g	1.93		
118 - 2,3',4,4',5-Pentachlorobiphenyl	345	pg/g	1.71		
123 - 2',3,4,4',5-Pentachlorobiphenyl	7	pg/g	1.99		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.36	pg/g	2.18		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	57.8	pg/g	0.502		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	16.8	pg/g	0.459		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	24.4	pg/g	0.399		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.519	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	57.2	pg/g	0.096	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	195	pg/g	0.084	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.17	pg/g	0.148		

SLC
10-8-01

Sample Results

Sample FS-05-VS-R

Fish: Vermilion Snapper

Lab ID L2767-3

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.821	U	RB-I
Total Dichlorobiphenyls	13.5	pg/g	0.399		
Total Trichlorobiphenyls	74.6	pg/g	0.16		
Total Tetrachlorobiphenyls	392	pg/g	0.491		
Total Pentachlorobiphenyls	1640	pg/g	2.18		
Total Hexachlorobiphenyls	2370	pg/g	0.691		
Total Heptachlorobiphenyls	732	pg/g	0.148		
Total Octachlorobiphenyls	297	pg/g	0.142		
Total Nonachlorobiphenyls	98.8	pg/g	0.141		
209 - Decachlorobiphenyl	10.5	pg/g	0.0621		
Total Polychlorinated Biphenyls	5630	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-VS-R

Fish: Vermilion Snapper

Lab ID L2767-3R

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.54	pg/g	0.248		
18 - 2,2',5-Trichlorobiphenyl	7.69	pg/g	0.123	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	19	pg/g	0.102	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	49.7	pg/g	0.103	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	34.7	pg/g	0.0829	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	74.1	pg/g	0.0916		
66 - 2,3',4,4'-Tetrachlorobiphenyl	47.1	pg/g	0.404		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.62	pg/g	0.491		
87 - 2,2',3,4,5-Pentachlorobiphenyl	149	pg/g	0.439	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	296	pg/g	0.369	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	130	pg/g	2.17		
118 - 2,3',4,4',5-Pentachlorobiphenyl	345	pg/g	1.71		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.36	pg/g	2.18		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	87.6	pg/g	0.551	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	620	pg/g	0.528	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	773	pg/g	0.456	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	57.8	pg/g	0.502		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.519	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	57.2	pg/g	0.096	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	195	pg/g	0.084	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	77.7	pg/g	0.103	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.51	pg/g	0.0738		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	181	pg/g	0.073		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.96	pg/g	0.142		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	62.6	pg/g	0.141		
209 - Decachlorobiphenyl	10.5	pg/g	0.0621		

SLC
10-8-01

Sample Results

Sample FS-07-VS-R

Fish: Vermilion Snapper

Lab ID L2767-4

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.36	pg/g	0.986		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	116	pg/g	2.29		
114 - 2,3,4,4',5-Pentachlorobiphenyl	ND	pg/g	5.7	U	ID(IR)-I
118 - 2,3',4,4',5-Pentachlorobiphenyl	322	pg/g	2.18		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.16	pg/g	2.33		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.42	pg/g	2.38		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.2	pg/g	0.347		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.8	pg/g	0.318		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	31.6	pg/g	0.753		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.814	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	77.8	pg/g	0.199	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	237	pg/g	0.18	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.72	pg/g	0.243		

SLC
10-8-01

Sample Results

Sample FS-07-VS-R

Fish: Vermilion Snapper

Lab ID L2767-4

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.283	U	
Total Dichlorobiphenyls	9.58	pg/g	0.75		
Total Trichlorobiphenyls	50.4	pg/g	0.294		
Total Tetrachlorobiphenyls	258	pg/g	0.986		
Total Pentachlorobiphenyls	1320	pg/g	2.51		
Total Hexachlorobiphenyls	2290	pg/g	1.37		
Total Heptachlorobiphenyls	684	pg/g	0.267		
Total Octachlorobiphenyls	263	pg/g	0.26		
Total Nonachlorobiphenyls	96.1	pg/g	0.21		
209 - Decachlorobiphenyl	9.59	pg/g	0.16		
Total Polychlorinated Biphenyls	4980	pg/g			

SLC
10-8-01

Sample Results

Sample FS-07-VS-R Fish: Vermilion Snapper

Lab ID L2767-4 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.97	pg/g	0.497		
18 - 2,2',5-Trichlorobiphenyl	4.7	pg/g	0.234	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	15.6	pg/g	0.178	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	37.5	pg/g	0.206	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	22.7	pg/g	0.161	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	50.1	pg/g	0.177		
66 - 2,3',4,4'-Tetrachlorobiphenyl	28.9	pg/g	0.797		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.36	pg/g	0.986		
87 - 2,2',3,4,5-Pentachlorobiphenyl	116	pg/g	0.397	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	222	pg/g	0.333	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	116	pg/g	2.29		
118 - 2,3',4,4',5-Pentachlorobiphenyl	322	pg/g	2.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.42	pg/g	2.38		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	98.1	pg/g	1.07	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	623	pg/g	1.05	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	849	pg/g	0.923	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.2	pg/g	0.347		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.814	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	77.8	pg/g	0.199	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	237	pg/g	0.18	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	89.8	pg/g	0.242	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	2.37	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	108	pg/g	0.169		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.05	pg/g	0.158		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	69.4	pg/g	0.193		
209 - Decachlorobiphenyl	9.59	pg/g	0.16		

SLC 10-8-01

Sample Results

Sample FS-09-VS-R

Fish: Vermilion Snapper

Lab ID L2767-5

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.21	pg/g	0.552		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	94.5	pg/g	1.14		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.93	pg/g	1.09		
118 - 2,3',4,4',5-Pentachlorobiphenyl	257	pg/g	1.05		
123 - 2',3,4,4',5-Pentachlorobiphenyl	4.68	pg/g	1.14		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.79	pg/g	1.17		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	41.1	pg/g	0.568		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	11.2	pg/g	0.521		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	18.3	pg/g	0.722		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.825	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	43.3	pg/g	0.0329	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	134	pg/g	0.0293	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.99	pg/g	0.0643		

SLC
10-8-01

Sample Results

Sample FS-09-VS-R

Fish: Vermilion Snapper

Lab ID L2767-5

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.392	U	
Total Dichlorobiphenyls	10.2	pg/g	0.686		
Total Trichlorobiphenyls	51.6	pg/g	0.248		
Total Tetrachlorobiphenyls	231	pg/g	0.552		
Total Pentachlorobiphenyls	1090	pg/g	1.17		
Total Hexachlorobiphenyls	1500	pg/g	1.18		
Total Heptachlorobiphenyls	472	pg/g	0.0643		
Total Octachlorobiphenyls	194	pg/g	0.0492		
Total Nonachlorobiphenyls	68.6	pg/g	0.178		
209 - Decachlorobiphenyl	7.05	pg/g	0.024		
Total Polychlorinated Biphenyls	3620	pg/g			

SLC
10-8-07

Sample Results

Sample FS-09-VS-R Fish: Vermilion Snapper

Lab ID L2767-5 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.23	pg/g	0.461		
18 - 2,2',5-Trichlorobiphenyl	5.54	pg/g	0.166	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	12.7	pg/g	0.151	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	27.9	pg/g	0.0303	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	19	pg/g	0.0247	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	44.6	pg/g	0.0272		
66 - 2,3',4,4'-Tetrachlorobiphenyl	26	pg/g	0.415		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.21	pg/g	0.552		
87 - 2,2',3,4,5-Pentachlorobiphenyl	92.8	pg/g	0.13	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	187	pg/g	0.112	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	94.5	pg/g	1.14		
118 - 2,3',4,4',5-Pentachlorobiphenyl	257	pg/g	1.05		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.79	pg/g	1.17		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	62	pg/g	0.926	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	417	pg/g	0.896	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	512	pg/g	0.792	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	41.1	pg/g	0.568		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.825	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	43.3	pg/g	0.0329	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	134	pg/g	0.0293	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	49.5	pg/g	0.0367	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.89	pg/g	0.0267		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	118	pg/g	0.0264		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.5	pg/g	0.0492		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	45.1	pg/g	0.178		
209 - Decachlorobiphenyl	7.05	pg/g	0.024		

SLC
10-8-01

Sample Results

Sample FS-10-VS-R

Fish: Vermilion Snapper

Lab ID L2767-6

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.6	pg/g	1.54		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	170	pg/g	1.51		
114 - 2,3,4,4',5-Pentachlorobiphenyl	9.45	pg/g	1.49		
118 - 2,3',4,4',5-Pentachlorobiphenyl	466	pg/g	1.42		
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.08	pg/g	1.62		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.52	pg/g	1.46		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	79.6	pg/g	0.402		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	20.2	pg/g	0.369		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	34.5	pg/g	0.57		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.6	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	84.8	pg/g	0.119	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	252	pg/g	0.107	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.82	pg/g	0.268		

SLC
10-8-01

Sample Results

Sample FS-10-VS-R

Fish: Vermilion Snapper

Lab ID L2767-6

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.195	U	RB-I
Total Dichlorobiphenyls	15.4	pg/g	0.494		
Total Trichlorobiphenyls	74.3	pg/g	0.152		
Total Tetrachlorobiphenyls	389	pg/g	1.59		
Total Pentachlorobiphenyls	1970	pg/g	1.71		
Total Hexachlorobiphenyls	3320	pg/g	0.997		
Total Heptachlorobiphenyls	929	pg/g	0.268		
Total Octachlorobiphenyls	347	pg/g	0.179		
Total Nonachlorobiphenyls	133	pg/g	0.117		
209 - Decachlorobiphenyl	16.6	pg/g	0.0559		
Total Polychlorinated Biphenyls	7190	pg/g			

SLC
10-8-01

Sample Results

Sample FS-10-VS-R

Fish: Vermilion Snapper

Lab ID L2767-6

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.38	pg/g	0.337		
18 - 2,2',5-Trichlorobiphenyl	7.06	pg/g	0.112	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	20.7	pg/g	0.1	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	45.7	pg/g	0.087	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	32.8	pg/g	0.068	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	69.2	pg/g	0.0749		
66 - 2,3',4,4'-Tetrachlorobiphenyl	51.8	pg/g	1.3		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.6	pg/g	1.54		
87 - 2,2',3,4,5-Pentachlorobiphenyl	169	pg/g	0.297	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	330	pg/g	0.249	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	170	pg/g	1.51		
118 - 2,3',4,4',5-Pentachlorobiphenyl	466	pg/g	1.42		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.52	pg/g	1.46		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	139	pg/g	0.782	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	978	pg/g	0.766	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1130	pg/g	0.672	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	79.6	pg/g	0.402		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.6	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	84.8	pg/g	0.119	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	252	pg/g	0.107	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	100	pg/g	0.145	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.46	pg/g	0.105		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	233	pg/g	0.101		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.91	pg/g	0.179		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	86.9	pg/g	0.115		
209 - Decachlorobiphenyl	16.6	pg/g	0.0559		

SLC
10-8-01

Sample Results

Sample FS-11-VS-R

Fish: Vermilion Snapper

Lab ID L2767-7

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.81	pg/g	0.899		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	187	pg/g	2.18		
114 - 2,3,4,4',5-Pentachlorobiphenyl	9.73	pg/g	2.24		
118 - 2,3',4,4',5-Pentachlorobiphenyl	561	pg/g	2.18		
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.3	pg/g	2.48		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.7	pg/g	2.17		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	112	pg/g	0.555		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	27.6	pg/g	0.509		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	52	pg/g	0.621		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.628	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	143	pg/g	0.0721	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	416	pg/g	0.0653	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	7.68	pg/g	0.233		

JLC
10-8-01

Sample Results

Sample FS-11-VS-R

Fish: Vermilion Snapper

Lab ID L2767-7

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.849	U	RB-I
Total Dichlorobiphenyls	8.43	pg/g	0.462		
Total Trichlorobiphenyls	53.7	pg/g	0.116		
Total Tetrachlorobiphenyls	348	pg/g	0.919		
Total Pentachlorobiphenyls	2150	pg/g	2.57		
Total Hexachlorobiphenyls	4120	pg/g	1.08		
Total Heptachlorobiphenyls	1160	pg/g	0.233		
Total Octachlorobiphenyls	463	pg/g	0.222		
Total Nonachlorobiphenyls	188	pg/g	0.0964		
209 - Decachlorobiphenyl	28.1	pg/g	0.0702		
Total Polychlorinated Biphenyls	8520	pg/g			

JLC
10-8-01

Sample Results

Sample FS-11-VS-R Fish: Vermilion Snapper

Lab ID L2767-7 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.24	pg/g	0.323		
18 - 2,2',5-Trichlorobiphenyl	3.73	pg/g	0.0782	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	16.9	pg/g	0.0773	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	45.4	pg/g	0.0792	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	33.2	pg/g	0.062	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	64.4	pg/g	0.0682		
66 - 2,3',4,4'-Tetrachlorobiphenyl	45.6	pg/g	0.752		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.81	pg/g	0.899		
87 - 2,2',3,4,5-Pentachlorobiphenyl	161	pg/g	0.24	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	356	pg/g	0.202	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	187	pg/g	2.18		
118 - 2,3',4,4',5-Pentachlorobiphenyl	561	pg/g	2.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.7	pg/g	2.17		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	182	pg/g	0.849	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1150	pg/g	0.831	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1640	pg/g	0.729	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	112	pg/g	0.555		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.628	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	143	pg/g	0.0721	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	416	pg/g	0.0653	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	162	pg/g	0.0878	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.94	pg/g	0.0638		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	181	pg/g	0.0611		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	18.3	pg/g	0.222		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	135	pg/g	0.0924		
209 - Decachlorobiphenyl	28.1	pg/g	0.0702		

SLC
10-8-01

Sample Results

Sample FS-13-VS-R

Fish: Vermilion Snapper

Lab ID L2767-8

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.65	pg/g	1.44		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	115	pg/g	1.56		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.65	pg/g	1.51		
118 - 2,3',4,4',5-Pentachlorobiphenyl	305	pg/g	1.48		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.16	pg/g	1.61		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.66	pg/g	1.6		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	50.7	pg/g	0.418		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	15.2	pg/g	0.383		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	21.5	pg/g	0.41		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.454	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	49.3	pg/g	0.102	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	145	pg/g	0.0927	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.67	pg/g	0.217		

JLC
10-8-01

Sample Results

Sample FS-13-VS-R

Fish: Vermilion Snapper

Lab ID L2767-8

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.794	U	RB-I
Total Dichlorobiphenyls	17.1	pg/g	0.698		
Total Trichlorobiphenyls	87.2	pg/g	0.165		
Total Tetrachlorobiphenyls	357	pg/g	1.46		
Total Pentachlorobiphenyls	1430	pg/g	1.75		
Total Hexachlorobiphenyls	2000	pg/g	0.759		
Total Heptachlorobiphenyls	614	pg/g	0.217		
Total Octachlorobiphenyls	221	pg/g	0.104		
Total Nonachlorobiphenyls	100	pg/g	0.132		
209 - Decachlorobiphenyl	9.63	pg/g	0.0569		
Total Polychlorinated Biphenyls	4840	pg/g			

SLC
10-8-07

Sample Results

Sample FS-13-VS-R

Fish: Vermilion Snapper

Lab ID L2767-8

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.01	pg/g	0.452		
18 - 2,2',5-Trichlorobiphenyl	9.33	pg/g	0.104	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	22	pg/g	0.108	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	45.8	pg/g	0.0725	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	30.4	pg/g	0.0567	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	66.4	pg/g	0.0624		
66 - 2,3',4,4'-Tetrachlorobiphenyl	39.9	pg/g	1.2		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.65	pg/g	1.44		
87 - 2,2',3,4,5-Pentachlorobiphenyl	135	pg/g	0.284	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	245	pg/g	0.238	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	115	pg/g	1.56		
118 - 2,3',4,4',5-Pentachlorobiphenyl	305	pg/g	1.48		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.66	pg/g	1.6		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	86.8	pg/g	0.595	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	552	pg/g	0.583	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	621	pg/g	0.512	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	50.7	pg/g	0.418		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.454	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	49.3	pg/g	0.102	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	145	pg/g	0.0927	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	62.9	pg/g	0.125	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.13	pg/g	0.0906		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	143	pg/g	0.0868		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.46	pg/g	0.0519		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	63.4	pg/g	0.122		
209 - Decachlorobiphenyl	9.63	pg/g	0.0569		

SLC
10-8-01

Sample Results

Sample FS-14-VS-R

Fish: Vermilion Snapper

Lab ID L2767-9

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.65	pg/g	0.708		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	148	pg/g	1.56		
114 - 2,3,4,4',5-Pentachlorobiphenyl	8.01	pg/g	1.47		
118 - 2,3',4,4',5-Pentachlorobiphenyl	378	pg/g	1.41		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.99	pg/g	1.54		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.18	pg/g	1.5		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	63.6	pg/g	0.698		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.4	pg/g	0.64		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	26.8	pg/g	0.411		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.71	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	60.4	pg/g	0.0418	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	177	pg/g	0.0373	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.99	pg/g	0.133		

SLC
10-8-01

Sample Results

Sample FS-14-VS-R

Fish: Vermilion Snapper

Lab ID L2767-9

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.8	pg/g	0.283		
Total Dichlorobiphenyls	19.7	pg/g	0.842		
Total Trichlorobiphenyls	88.5	pg/g	0.192		
Total Tetrachlorobiphenyls	364	pg/g	0.708		
Total Pentachlorobiphenyls	1750	pg/g	1.56		
Total Hexachlorobiphenyls	2230	pg/g	0.71		
Total Heptachlorobiphenyls	675	pg/g	0.133		
Total Octachlorobiphenyls	271	pg/g	0.0325		
Total Nonachlorobiphenyls	95.6	pg/g	0.172		
209 - Decachlorobiphenyl	10.5	pg/g	0.03		
Total Polychlorinated Biphenyls	5510	pg/g			

SLC
10-8-01

Sample Results

Sample FS-14-VS-R Fish: Vermilion Snapper

Lab ID L2767-9 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.69	pg/g	0.497		
18 - 2,2',5-Trichlorobiphenyl	9.7	pg/g	0.141	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	21.9	pg/g	0.125	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	46	pg/g	0.0394	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	29.6	pg/g	0.0321	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	67.8	pg/g	0.0354		
66 - 2,3',4,4'-Tetrachlorobiphenyl	39.1	pg/g	0.56		
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.65	pg/g	0.708		
87 - 2,2',3,4,5-Pentachlorobiphenyl	166	pg/g	0.221	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	307	pg/g	0.19	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	148	pg/g	1.56		
118 - 2,3',4,4',5-Pentachlorobiphenyl	378	pg/g	1.41		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.18	pg/g	1.5		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	98.8	pg/g	0.529	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	600	pg/g	0.512	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	682	pg/g	0.452	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	63.6	pg/g	0.698		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.71	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	60.4	pg/g	0.0418	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	177	pg/g	0.0373	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	63.7	pg/g	0.0468	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.22	pg/g	0.034		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	165	pg/g	0.0336		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.59	pg/g	0.0325		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	62.7	pg/g	0.172		
209 - Decachlorobiphenyl	10.5	pg/g	0.03		

SLC
10-8-01

Sample Results

Sample FS-15-VS-R

Fish: Vermilion Snapper

Lab ID L2767-10

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.61	pg/g	0.922		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	271	pg/g	1.87		
114 - 2,3,4,4',5-Pentachlorobiphenyl	13.8	pg/g	1.84		
118 - 2,3',4,4',5-Pentachlorobiphenyl	826	pg/g	1.7		
123 - 2',3,4,4',5-Pentachlorobiphenyl	14.4	pg/g	1.89		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.44	pg/g	1.96		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	131	pg/g	0.478		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	34.1	pg/g	0.439		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	65.4	pg/g	0.447		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.668	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	154	pg/g	0.0253	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	465	pg/g	0.0225	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.54	pg/g	0.173		

SLC
10-8-01

Sample Results

Sample FS-15-VS-R

Fish: Vermilion Snapper

Lab ID L2767-10

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.935	U	RB-I
Total Dichlorobiphenyls	12.1	pg/g	0.631		
Total Trichlorobiphenyls	63.9	pg/g	0.177		
Total Tetrachlorobiphenyls	422	pg/g	0.922		
Total Pentachlorobiphenyls	2970	pg/g	1.96		
Total Hexachlorobiphenyls	5070	pg/g	0.771		
Total Heptachlorobiphenyls	1350	pg/g	0.173		
Total Octachlorobiphenyls	489	pg/g	0.111		
Total Nonachlorobiphenyls	182	pg/g	0.0963		
209 - Decachlorobiphenyl	17.7	pg/g	0.0264		
Total Polychlorinated Biphenyls	10600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-15-VS-R

Fish: Vermilion Snapper

Lab ID L2767-10

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.96	pg/g	0.366		
18 - 2,2',5-Trichlorobiphenyl	4.76	pg/g	0.138	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	18.9	pg/g	0.0919	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	48.6	pg/g	0.0332	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	35.1	pg/g	0.0271	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	73.1	pg/g	0.0298		
66 - 2,3',4,4'-Tetrachlorobiphenyl	62.3	pg/g	0.715		
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.61	pg/g	0.922		
87 - 2,2',3,4,5-Pentachlorobiphenyl	217	pg/g	0.0946	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	510	pg/g	0.0812	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	271	pg/g	1.87		
118 - 2,3',4,4',5-Pentachlorobiphenyl	826	pg/g	1.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.44	pg/g	1.96		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	218	pg/g	0.604	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1450	pg/g	0.584	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1960	pg/g	0.516	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	131	pg/g	0.478		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.668	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	154	pg/g	0.0253	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	465	pg/g	0.0225	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	174	pg/g	0.0282	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.34	pg/g	0.0206		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	272	pg/g	0.0203		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	16.9	pg/g	0.111		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	131	pg/g	0.0963		
209 - Decachlorobiphenyl	17.7	pg/g	0.0264		

SLC
10-8-01

Sample Results

Sample FS-16-VS-R

Fish: Vermilion Snapper

Lab ID L2767-11

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.65	pg/g	0.957		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	182	pg/g	1.82		
114 - 2,3,4,4',5-Pentachlorobiphenyl	12.1	pg/g	1.87		
118 - 2,3',4,4',5-Pentachlorobiphenyl	661	pg/g	1.72		
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.56	pg/g	1.89		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.5	pg/g	1.85		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	102	pg/g	0.494		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	25.7	pg/g	0.453		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	46.8	pg/g	0.382		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.25	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	105	pg/g	0.0278	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	317	pg/g	0.0248	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.49	pg/g	0.0977		

SLC
10-8-01

Sample Results

Sample FS-16-VS-R

Fish: Vermilion Snapper

Lab ID L2767-11

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.959	U	RB-I
Total Dichlorobiphenyls	10.5	pg/g	0.495		
Total Trichlorobiphenyls	58.4	pg/g	0.13		
Total Tetrachlorobiphenyls	351	pg/g	0.957		
Total Pentachlorobiphenyls	2280	pg/g	1.89		
Total Hexachlorobiphenyls	3400	pg/g	1.25		
Total Heptachlorobiphenyls	1040	pg/g	0.0977		
Total Octachlorobiphenyls	375	pg/g	0.0497		
Total Nonachlorobiphenyls	132	pg/g	0.094		
209 - Decachlorobiphenyl	13.4	pg/g	0.0159		
Total Polychlorinated Biphenyls	7660	pg/g			

SLC
10-8-01

Sample Results

Sample FS-16-VS-R

Fish: Vermilion Snapper

Lab ID L2767-11

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.63	pg/g	0.297		
18 - 2,2',5-Trichlorobiphenyl	6.26	pg/g	0.102	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	15.1	pg/g	0.0673	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	37.7	pg/g	0.0269	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	30.6	pg/g	0.0219	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	63.5	pg/g	0.0241		
66 - 2,3',4,4'-Tetrachlorobiphenyl	46.9	pg/g	0.742		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.65	pg/g	0.957		
87 - 2,2',3,4,5-Pentachlorobiphenyl	170	pg/g	0.1	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	373	pg/g	0.0862	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	182	pg/g	1.82		
118 - 2,3',4,4',5-Pentachlorobiphenyl	661	pg/g	1.72		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.5	pg/g	1.85		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	135	pg/g	0.491	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	921	pg/g	0.476	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1240	pg/g	0.42	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	102	pg/g	0.494		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.25	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	105	pg/g	0.0278	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	317	pg/g	0.0248	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	108	pg/g	0.0311	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.81	pg/g	0.0226		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	267	pg/g	0.0223		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	11.6	pg/g	0.0497		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	90	pg/g	0.094		
209 - Decachlorobiphenyl	13.4	pg/g	0.0159		

SLC
10-8-01

Sample Results

Sample FS-17-VS-R

Fish: Vermilion Snapper

Lab ID L2767-12

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.37	pg/g	0.486		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	168	pg/g	1.29		
114 - 2,3,4,4',5-Pentachlorobiphenyl	9.95	pg/g	1.3		
118 - 2,3',4,4',5-Pentachlorobiphenyl	417	pg/g	1.24		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.02	pg/g	1.37		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.4	pg/g	1.3		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.4	pg/g	0.318		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	16.7	pg/g	0.292		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	24.4	pg/g	0.34		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.483	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	50.3	pg/g	0.0206	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	147	pg/g	0.0184	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.32	pg/g	0.0775		

SLC
10-8-01

Sample Results

Sample FS-17-VS-R

Fish: Vermilion Snapper

Lab ID L2767-12

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.43	pg/g	0.258		
Total Dichlorobiphenyls	14.5	pg/g	0.515		
Total Trichlorobiphenyls	68.3	pg/g	0.165		
Total Tetrachlorobiphenyls	304	pg/g	0.486		
Total Pentachlorobiphenyls	1650	pg/g	1.37		
Total Hexachlorobiphenyls	1960	pg/g	0.556		
Total Heptachlorobiphenyls	544	pg/g	0.0775		
Total Octachlorobiphenyls	203	pg/g	0.0389		
Total Nonachlorobiphenyls	62.9	pg/g	0.0932		
209 - Decachlorobiphenyl	5.83	pg/g	0.0209		
Total Polychlorinated Biphenyls	4810	pg/g			

SLC
10-8-01

Sample Results

Sample FS-17-VS-R

Fish: Vermilion Snapper

Lab ID L2767-12

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.63	pg/g	0.309		
18 - 2,2',5-Trichlorobiphenyl	8	pg/g	0.129	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	16.4	pg/g	0.0894	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	35.2	pg/g	0.0412	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	24	pg/g	0.0335	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	53.8	pg/g	0.037		
66 - 2,3',4,4'-Tetrachlorobiphenyl	34.1	pg/g	0.373		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.37	pg/g	0.486		
87 - 2,2',3,4,5-Pentachlorobiphenyl	134	pg/g	0.079	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	270	pg/g	0.0679	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	168	pg/g	1.29		
118 - 2,3',4,4',5-Pentachlorobiphenyl	417	pg/g	1.24		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.4	pg/g	1.3		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	91.6	pg/g	0.435	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	562	pg/g	0.421	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	603	pg/g	0.372	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.4	pg/g	0.318		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.483	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	50.3	pg/g	0.0206	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	147	pg/g	0.0184	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	54.2	pg/g	0.023	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.73	pg/g	0.0168		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	128	pg/g	0.0165		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.14	pg/g	0.0389		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	39.8	pg/g	0.0932		
209 - Decachlorobiphenyl	5.83	pg/g	0.0209		

SLC
10-8-01

Sample Results

Sample FS-18-VS-R

Fish: Vermilion Snapper

Lab ID L2767-13

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.31	pg/g	0.618		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	119	pg/g	1.14		
114 - 2,3,4,4',5-Pentachlorobiphenyl	6.39	pg/g	1.12		
118 - 2,3',4,4',5-Pentachlorobiphenyl	320	pg/g	1.08		
123 - 2',3,4,4',5-Pentachlorobiphenyl	4.95	pg/g	1.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.3	pg/g	1.16		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	46.8	pg/g	0.663		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	13.4	pg/g	0.608		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	21.7	pg/g	0.367		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.407	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	46.7	pg/g	0.0317	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	145	pg/g	0.0283	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.32	pg/g	0.124		

SLC
10-8-01

Sample Results

Sample FS-18-VS-R

Fish: Vermilion Snapper

Lab ID L2767-13

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.983	U	RB-I
Total Dichlorobiphenyls	10.5	pg/g	0.539		
Total Trichlorobiphenyls	54.2	pg/g	0.155		
Total Tetrachlorobiphenyls	253	pg/g	0.618		
Total Pentachlorobiphenyls	1350	pg/g	1.18		
Total Hexachlorobiphenyls	1760	pg/g	0.597		
Total Heptachlorobiphenyls	539	pg/g	0.124		
Total Octachlorobiphenyls	207	pg/g	0.0369		
Total Nonachlorobiphenyls	62.8	pg/g	0.164		
209 - Decachlorobiphenyl	5.74	pg/g	0.0276		
Total Polychlorinated Biphenyls	4240	pg/g			

SLC
10-8-01

Sample Results

Sample FS-18-VS-R Fish: Vermilion Snapper

Lab ID L2767-13 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.34	pg/g	0.324		
18 - 2,2',5-Trichlorobiphenyl	5.65	pg/g	0.121	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	14.2	pg/g	0.0848	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	29.2	pg/g	0.0396	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	21.1	pg/g	0.0322	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	48.2	pg/g	0.0355		
66 - 2,3',4,4'-Tetrachlorobiphenyl	30.3	pg/g	0.485		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.31	pg/g	0.618		
87 - 2,2',3,4,5-Pentachlorobiphenyl	120	pg/g	0.0954	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	238	pg/g	0.0819	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	119	pg/g	1.14		
118 - 2,3',4,4',5-Pentachlorobiphenyl	320	pg/g	1.08		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.3	pg/g	1.16		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	75.4	pg/g	0.467	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	485	pg/g	0.452	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	569	pg/g	0.4	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	46.8	pg/g	0.663		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.407	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	46.7	pg/g	0.0317	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	145	pg/g	0.0283	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	56	pg/g	0.0354	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.95	pg/g	0.0258		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	135	pg/g	0.0255		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.61	pg/g	0.0369		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40	pg/g	0.164		
209 - Decachlorobiphenyl	5.74	pg/g	0.0276		

SLC
10-8-01

Sample Results

Sample FS-21-VS-R

Fish: Vermilion Snapper

Lab ID L2767-14

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.94	pg/g	0.82		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	142	pg/g	1.42		
114 - 2,3,4,4',5-Pentachlorobiphenyl	8.21	pg/g	1.38		
118 - 2,3',4,4',5-Pentachlorobiphenyl	407	pg/g	1.36		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6	pg/g	1.51		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.68	pg/g	1.4		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.9	pg/g	0.532		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.1	pg/g	0.488		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	32.6	pg/g	0.469		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.914	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	88.3	pg/g	0.0471	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	263	pg/g	0.042	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.55	pg/g	0.12		

SLC
10-8-01

Sample Results

Sample FS-21-VS-R

Fish: Vermilion Snapper

Lab ID L2767-14

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.67	pg/g	0.239		
Total Dichlorobiphenyls	9.88	pg/g	0.514		
Total Trichlorobiphenyls	62.2	pg/g	0.182		
Total Tetrachlorobiphenyls	303	pg/g	0.82		
Total Pentachlorobiphenyls	1670	pg/g	1.51		
Total Hexachlorobiphenyls	2670	pg/g	0.914		
Total Heptachlorobiphenyls	909	pg/g	0.12		
Total Octachlorobiphenyls	351	pg/g	0.087		
Total Nonachlorobiphenyls	118	pg/g	0.107		
209 - Decachlorobiphenyl	11.1	pg/g	0.0205		
Total Polychlorinated Biphenyls	6110	pg/g			

SLC
10-8-01

Sample Results

Sample FS-21-VS-R

Fish: Vermilion Snapper

Lab ID L2767-14

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.98	pg/g	0.306		
18 - 2,2',5-Trichlorobiphenyl	6.57	pg/g	0.142	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	16	pg/g	0.0841	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	36.6	pg/g	0.0285	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	27.2	pg/g	0.0232	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	55	pg/g	0.0256		
66 - 2,3',4,4'-Tetrachlorobiphenyl	35.1	pg/g	0.647		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.94	pg/g	0.82		
87 - 2,2',3,4,5-Pentachlorobiphenyl	139	pg/g	0.102	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	280	pg/g	0.0876	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	142	pg/g	1.42		
118 - 2,3',4,4',5-Pentachlorobiphenyl	407	pg/g	1.36		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.68	pg/g	1.4		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	110	pg/g	0.597	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	736	pg/g	0.578	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	919	pg/g	0.511	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.9	pg/g	0.532		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.914	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	88.3	pg/g	0.0471	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	263	pg/g	0.042	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	94.9	pg/g	0.0527	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.85	pg/g	0.0383		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	214	pg/g	0.0379		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	11.1	pg/g	0.087		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	78.9	pg/g	0.107		
209 - Decachlorobiphenyl	11.1	pg/g	0.0205		

SLC
10-8-01

Sample Results

Sample FS-22-VS-R

Fish: Vermilion Snapper

Lab ID L2767-15

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.33	pg/g	0.711		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	246	pg/g	2.02		
114 - 2,3,4,4',5-Pentachlorobiphenyl	13.1	pg/g	1.99		
118 - 2,3',4,4',5-Pentachlorobiphenyl	649	pg/g	1.94		
123 - 2',3,4,4',5-Pentachlorobiphenyl	9.43	pg/g	2.17		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.02	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	88.5	pg/g	0.379		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	20.6	pg/g	1.9		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	33.2	pg/g	0.229		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.397	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	74.9	pg/g	0.0325	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	204	pg/g	0.029	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.66	pg/g	0.0992		

SLC
10-8-01

Sample Results

Sample FS-22-VS-R

Fish: Vermilion Snapper

Lab ID L2767-15

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.42	U	RB-I
Total Dichlorobiphenyls	ND	pg/g	2.36	U	RB-I
Total Trichlorobiphenyls	23.6	pg/g	0.172		
Total Tetrachlorobiphenyls	421	pg/g	0.711		
Total Pentachlorobiphenyls	2530	pg/g	2.17		
Total Hexachlorobiphenyls	2410	pg/g	0.397		
Total Heptachlorobiphenyls	654	pg/g	0.0992		
Total Octachlorobiphenyls	221	pg/g	0.0294		
Total Nonachlorobiphenyls	87.9	pg/g	0.096		
209 - Decachlorobiphenyl	8.19	pg/g	0.0218		
Total Polychlorinated Biphenyls	6360	pg/g			

JLC
10-8-01

Sample Results

Sample FS-22-VS-R Fish: Vermilion Snapper

Lab ID L2767-15 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.835	pg/g	0.329		
18 - 2,2',5-Trichlorobiphenyl	1.3	pg/g	0.134	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	7.77	pg/g	0.0863	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	32.6	pg/g	0.0355	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	28.6	pg/g	0.0289	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	90.5	pg/g	0.0319		
66 - 2,3',4,4'-Tetrachlorobiphenyl	53	pg/g	0.547		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.33	pg/g	0.711		
87 - 2,2',3,4,5-Pentachlorobiphenyl	209	pg/g	0.118	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	465	pg/g	0.101	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	246	pg/g	2.02		
118 - 2,3',4,4',5-Pentachlorobiphenyl	649	pg/g	1.94		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.02	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	116	pg/g	0.293	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	737	pg/g	0.283	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	703	pg/g	0.25	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	88.5	pg/g	0.379		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.397	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	74.9	pg/g	0.0325	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	204	pg/g	0.029	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	72	pg/g	0.0363	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.82	pg/g	0.0265		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	134	pg/g	0.0261		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.91	pg/g	0.0277		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	59.1	pg/g	0.096		
209 - Decachlorobiphenyl	8.19	pg/g	0.0218		

SLC
10-8-01

Sample Results

Sample FS-01-VS-T

Fish: Vermilion Snapper

Lab ID L2767-16

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.11	pg/g	1.17		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	324	pg/g	2.9	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	16.9	pg/g	2.84		
118 - 2,3',4,4',5-Pentachlorobiphenyl	904	pg/g	2.7	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	9.71	pg/g	2.94		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.08	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	90.1	pg/g	0.518		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	21.9	pg/g	0.475		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	38.6	pg/g	0.498		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.547	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	77.4	pg/g	0.0333	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	211	pg/g	0.0284	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.02	pg/g	0.107		

SLC
10-8-01

Sample Results

Sample FS-01-VS-T

Fish: Vermilion Snapper

Lab ID L2767-16

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.63	pg/g	0.13		
Total Dichlorobiphenyls	20.6	pg/g	0.302		
Total Trichlorobiphenyls	167	pg/g	0.16		
Total Tetrachlorobiphenyls	1290	pg/g	1.17		
Total Pentachlorobiphenyls	4750	pg/g	3.1		
Total Hexachlorobiphenyls	3710	pg/g	0.808		
Total Heptachlorobiphenyls	805	pg/g	0.107		
Total Octachlorobiphenyls	258	pg/g	0.0729		
Total Nonachlorobiphenyls	67.5	pg/g	0.0676		
209 - Decachlorobiphenyl	5.67	pg/g	0.0182		
Total Polychlorinated Biphenyls	11100	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-VS-T Fish: Vermilion Snapper

Lab ID L2767-16 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.87	pg/g	0.194		
18 - 2,2',5-Trichlorobiphenyl	27.1	pg/g	0.088	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	27.9	pg/g	0.105	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	142	pg/g	0.0365	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	114	pg/g	0.0295	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	354	pg/g	0.0321		
66 - 2,3',4,4'-Tetrachlorobiphenyl	117	pg/g	0.909		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.11	pg/g	1.17		
87 - 2,2',3,4,5-Pentachlorobiphenyl	508	pg/g	0.356	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	818	pg/g	0.305	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	324	pg/g	2.9	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	904	pg/g	2.7	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.08	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	163	pg/g	0.645	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1050	pg/g	0.617	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1020	pg/g	0.535	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	90.1	pg/g	0.518		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.547	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	77.4	pg/g	0.0333	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	211	pg/g	0.0284	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	83.5	pg/g	0.0356	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2	pg/g	0.0245		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	187	pg/g	0.0253		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.42	pg/g	0.0719		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42.4	pg/g	0.0676		
209 - Decachlorobiphenyl	5.67	pg/g	0.0182		

SLC
10-8-01

Sample Results

Sample FS-02-VS-T

Fish: Vermilion Snapper

Lab ID L2767-17

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.25	pg/g	0.772		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	233	pg/g	2.25	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	12.6	pg/g	2.36		
118 - 2,3',4,4',5-Pentachlorobiphenyl	643	pg/g	2.18	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.39	pg/g	2.39		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.39	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	68.4	pg/g	0.271		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	17.1	pg/g	0.248		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	30.3	pg/g	0.548		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.694	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80.1	pg/g	0.0483	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	234	pg/g	0.0412	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.02	pg/g	0.111		

SLC
10-8-01

Sample Results

Sample FS-02-VS-T

Fish: Vermilion Snapper

Lab ID L2767-17

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.53	pg/g	0.0954		
Total Dichlorobiphenyls	15.1	pg/g	0.262		
Total Trichlorobiphenyls	132	pg/g	0.123		
Total Tetrachlorobiphenyls	986	pg/g	0.772		
Total Pentachlorobiphenyls	3590	pg/g	2.48		
Total Hexachlorobiphenyls	3020	pg/g	0.892		
Total Heptachlorobiphenyls	860	pg/g	0.111		
Total Octachlorobiphenyls	277	pg/g	0.0732		
Total Nonachlorobiphenyls	67.6	pg/g	0.0816		
209 - Decachlorobiphenyl	6.18	pg/g	0.0237		
Total Polychlorinated Biphenyls	8960	pg/g			

SLC
10-8-01

Sample Results

Sample FS-02-VS-T Fish: Vermilion Snapper

Lab ID L2767-17 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.41	pg/g	0.159		
18 - 2,2',5-Trichlorobiphenyl	21.6	pg/g	0.0856	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	21.7	pg/g	0.0801	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	121	pg/g	0.0174	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	87	pg/g	0.014	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	284	pg/g	0.0153		
66 - 2,3',4,4'-Tetrachlorobiphenyl	82	pg/g	0.601		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.25	pg/g	0.772		
87 - 2,2',3,4,5-Pentachlorobiphenyl	389	pg/g	0.489	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	598	pg/g	0.419	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	233	pg/g	2.25	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	643	pg/g	2.18	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.39	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	130	pg/g	0.713	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	834	pg/g	0.681	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	856	pg/g	0.591	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	68.4	pg/g	0.271		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.694	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80.1	pg/g	0.0483	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	234	pg/g	0.0412	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	90.4	pg/g	0.0516	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.27	pg/g	0.0355		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	200	pg/g	0.0367		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	8.55	pg/g	0.0722		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42.1	pg/g	0.0816		
209 - Decachlorobiphenyl	6.18	pg/g	0.0237		

SLC
10-8-01

Sample Results

Sample FS-03-VS-T

Fish: Vermilion Snapper

Lab ID L2767-18

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.19	pg/g	0.424		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	227	pg/g	2.83	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	12.2	pg/g	2.84		
118 - 2,3',4,4',5-Pentachlorobiphenyl	628	pg/g	2.73	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	7.46	pg/g	3.02		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	67	pg/g	0.237		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	17.4	pg/g	0.217		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	27.8	pg/g	0.525		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.592	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	56.6	pg/g	0.0376	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	154	pg/g	0.0321	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.09	pg/g	0.12		

SLC
10-8-01

Sample Results

Sample FS-03-VS-T

Fish: Vermilion Snapper

Lab ID L2767-18

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.77	pg/g	0.0963		
Total Dichlorobiphenyls	19.8	pg/g	0.263		
Total Trichlorobiphenyls	139	pg/g	0.152		
Total Tetrachlorobiphenyls	946	pg/g	0.424		
Total Pentachlorobiphenyls	3440	pg/g	3.07		
Total Hexachlorobiphenyls	2640	pg/g	0.861		
Total Heptachlorobiphenyls	601	pg/g	0.12		
Total Octachlorobiphenyls	193	pg/g	0.0407		
Total Nonachlorobiphenyls	46.7	pg/g	0.078		
209 - Decachlorobiphenyl	4.03	pg/g	0.0258		
Total Polychlorinated Biphenyls	8030	pg/g			

SLC
10-8-01

Sample Results

Sample FS-03-VS-T Fish: Vermilion Snapper

Lab ID L2767-18 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.78	pg/g	0.159		
18 - 2,2',5-Trichlorobiphenyl	21.5	pg/g	0.08	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	25	pg/g	0.0999	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	114	pg/g	0.0393	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	79.8	pg/g	0.0318	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	256	pg/g	0.0346		
66 - 2,3',4,4'-Tetrachlorobiphenyl	82.1	pg/g	0.333		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.19	pg/g	0.424		
87 - 2,2',3,4,5-Pentachlorobiphenyl	370	pg/g	0.224	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	579	pg/g	0.192	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	227	pg/g	2.83	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	628	pg/g	2.73	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	122	pg/g	0.688	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	749	pg/g	0.658	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	696	pg/g	0.571	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	67	pg/g	0.237		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.592	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	56.6	pg/g	0.0376	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	154	pg/g	0.0321	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	59.7	pg/g	0.0402	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.81	pg/g	0.0277		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	137	pg/g	0.0286		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.15	pg/g	0.0401		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	29.1	pg/g	0.078		
209 - Decachlorobiphenyl	4.03	pg/g	0.0258		

SLC 10-8-01

Sample Results

Sample FS-04-VS-T

Fish: Vermilion Snapper

Lab ID L2767-19

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.23	pg/g	1.55		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	401	pg/g	3.69	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	22.4	pg/g	3.74		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1140	pg/g	3.38	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	12.9	pg/g	3.81		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.76	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	114	pg/g	0.516		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	26.1	pg/g	0.474		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	47.5	pg/g	0.404		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.568	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	103	pg/g	0.0366	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	280	pg/g	0.0313	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.89	pg/g	0.13		

SLC
10-8-01

Sample Results

Sample FS-04-VS-T

Fish: Vermilion Snapper

Lab ID L2767-19

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.46	pg/g	0.169		
Total Dichlorobiphenyls	17.6	pg/g	0.364		
Total Trichlorobiphenyls	153	pg/g	0.175		
Total Tetrachlorobiphenyls	1400	pg/g	1.55		
Total Pentachlorobiphenyls	5700	pg/g	3.95		
Total Hexachlorobiphenyls	4440	pg/g	0.664		
Total Heptachlorobiphenyls	1010	pg/g	0.13		
Total Octachlorobiphenyls	325	pg/g	0.0768		
Total Nonachlorobiphenyls	97.2	pg/g	0.0939		
209 - Decachlorobiphenyl	7.99	pg/g	0.0284		
Total Polychlorinated Biphenyls	13200	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-VS-T

Fish: Vermilion Snapper

Lab ID L2767-19

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.39	pg/g	0.235		
18 - 2,2',5-Trichlorobiphenyl	28.1	pg/g	0.108	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	23.4	pg/g	0.112	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	150	pg/g	0.0493	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	125	pg/g	0.0398	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	389	pg/g	0.0434		
66 - 2,3',4,4'-Tetrachlorobiphenyl	126	pg/g	1.22		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.23	pg/g	1.55		
87 - 2,2',3,4,5-Pentachlorobiphenyl	589	pg/g	0.264	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	968	pg/g	0.226	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	401	pg/g	3.69	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	1140	pg/g	3.38	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.76	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	201	pg/g	0.53	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1320	pg/g	0.507	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1230	pg/g	0.44	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	114	pg/g	0.516		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.568	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	103	pg/g	0.0366	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	280	pg/g	0.0313	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	109	pg/g	0.0392	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.48	pg/g	0.0269		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	230	pg/g	0.0279		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.82	pg/g	0.0757		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	64.1	pg/g	0.0939		
209 - Decachlorobiphenyl	7.99	pg/g	0.0284		

SLC
10-8-01

Sample Results

Sample FS-06-VS-T

Fish: Vermilion Snapper

Lab ID L2767-20

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.52	pg/g	1.18		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	245	pg/g	2.22	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	12.9	pg/g	2.1		
118 - 2,3',4,4',5-Pentachlorobiphenyl	660	pg/g	1.99	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	9.3	pg/g	2.25		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.34	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	78	pg/g	0.313		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.7	pg/g	0.287		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	33.6	pg/g	0.367		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.425	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.9	pg/g	0.0499	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	187	pg/g	0.0426	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.78	pg/g	0.1		

SLC
10-8-01

Sample Results

Sample FS-06-VS-T

Lab ID L2767-20

Fish: Vermilion Snapper

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.33	pg/g	0.183		
Total Dichlorobiphenyls	11.5	pg/g	0.3		
Total Trichlorobiphenyls	91.9	pg/g	0.158		
Total Tetrachlorobiphenyls	792	pg/g	1.18		
Total Pentachlorobiphenyls	3240	pg/g	2.34		
Total Hexachlorobiphenyls	2980	pg/g	0.618		
Total Heptachlorobiphenyls	695	pg/g	0.1		
Total Octachlorobiphenyls	210	pg/g	0.0559		
Total Nonachlorobiphenyls	57.2	pg/g	0.139		
209 - Decachlorobiphenyl	4.92	pg/g	0.0245		
Total Polychlorinated Biphenyls	8080	pg/g			

SLC
10-8-01

Sample Results

Sample FS-06-VS-T Fish: Vermilion Snapper

Lab ID L2767-20 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.82	pg/g	0.186		
18 - 2,2',5-Trichlorobiphenyl	13	pg/g	0.0958	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	18.6	pg/g	0.0982	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	99.8	pg/g	0.0532	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	67.1	pg/g	0.043	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	208	pg/g	0.0468		
66 - 2,3',4,4'-Tetrachlorobiphenyl	73.2	pg/g	0.884		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.52	pg/g	1.18		
87 - 2,2',3,4,5-Pentachlorobiphenyl	321	pg/g	0.28	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	566	pg/g	0.24	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	245	pg/g	2.22	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	660	pg/g	1.99	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.34	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	139	pg/g	0.494	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	844	pg/g	0.472	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	852	pg/g	0.41	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	78	pg/g	0.313		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.425	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.9	pg/g	0.0499	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	187	pg/g	0.0426	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	74	pg/g	0.0534	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.94	pg/g	0.0367		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	163	pg/g	0.038		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.03	pg/g	0.0551		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	36.4	pg/g	0.139		
209 - Decachlorobiphenyl	4.92	pg/g	0.0245		

SLC
10-8-01

Sample Results

Sample FS-07-VS-T

Fish: Vermilion Snapper

Lab ID L2767-21

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.77	pg/g	0.973		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	274	pg/g	2.91	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	14.7	pg/g	2.9		
118 - 2,3',4,4',5-Pentachlorobiphenyl	795	pg/g	2.75	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	11.6	pg/g	2.99		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.06	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	102	pg/g	0.261		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	23.6	pg/g	0.239		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	45.2	pg/g	0.489		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.546	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	103	pg/g	0.0361	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	268	pg/g	0.0308	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.94	pg/g	0.132		

SLC
10-8-01

Sample Results

Sample FS-07-VS-T

Fish: Vermilion Snapper

Lab ID L2767-21

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.63	pg/g	0.129		
Total Dichlorobiphenyls	15.5	pg/g	0.243		
Total Trichlorobiphenyls	129	pg/g	0.175		
Total Tetrachlorobiphenyls	977	pg/g	0.973		
Total Pentachlorobiphenyls	3870	pg/g	3.12		
Total Hexachlorobiphenyls	3900	pg/g	0.816		
Total Heptachlorobiphenyls	997	pg/g	0.132		
Total Octachlorobiphenyls	297	pg/g	0.0715		
Total Nonachlorobiphenyls	85.1	pg/g	0.108		
209 - Decachlorobiphenyl	14.9	pg/g	0.0275		
Total Polychlorinated Biphenyls	10300	pg/g			

SLC
10-8-01

Sample Results

Sample FS-07-VS-T

Fish: Vermilion Snapper

Lab ID L2767-21

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.94	pg/g	0.154		
18 - 2,2',5-Trichlorobiphenyl	18.9	pg/g	0.115	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	25.5	pg/g	0.108	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	123	pg/g	0.0415	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	88.5	pg/g	0.0335	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	257	pg/g	0.0365		
66 - 2,3',4,4'-Tetrachlorobiphenyl	90.9	pg/g	0.746		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.77	pg/g	0.973		
87 - 2,2',3,4,5-Pentachlorobiphenyl	380	pg/g	0.17	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	645	pg/g	0.146	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	274	pg/g	2.91	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	795	pg/g	2.75	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.06	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	177	pg/g	0.652	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1110	pg/g	0.623	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1110	pg/g	0.541	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	102	pg/g	0.261		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.546	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	103	pg/g	0.0361	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	268	pg/g	0.0308	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	103	pg/g	0.0386	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.21	pg/g	0.0265		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	219	pg/g	0.0275		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	10.8	pg/g	0.0705		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	51.8	pg/g	0.108		
209 - Decachlorobiphenyl	14.9	pg/g	0.0275		

SLC
10-8-01

Sample Results

Sample FS-09-VS-T

Fish: Vermilion Snapper

Lab ID L2767-22

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.37	pg/g	0.884		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	615	pg/g	5.75	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	37.6	pg/g	5.87		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1810	pg/g	5.17	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	22.9	pg/g	5.99		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.05	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	199	pg/g	0.346		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	44.2	pg/g	0.317		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	82.3	pg/g	0.646		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.71	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	196	pg/g	0.0496	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	577	pg/g	0.0424	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	9.23	pg/g	0.187		

SLC
10-8-01

Sample Results

Sample FS-09-VS-T

Fish: Vermilion Snapper

Lab ID L2767-22

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.3	pg/g	0.108		
Total Dichlorobiphenyls	11.7	pg/g	0.264		
Total Trichlorobiphenyls	131	pg/g	0.111		
Total Tetrachlorobiphenyls	2160	pg/g	0.884		
Total Pentachlorobiphenyls	9360	pg/g	6.17		
Total Hexachlorobiphenyls	7960	pg/g	1.11		
Total Heptachlorobiphenyls	2090	pg/g	0.187		
Total Octachlorobiphenyls	785	pg/g	0.164		
Total Nonachlorobiphenyls	198	pg/g	0.0795		
209 - Decachlorobiphenyl	14.4	pg/g	0.0262		
Total Polychlorinated Biphenyls	22700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-09-VS-T

Fish: Vermilion Snapper

Lab ID L2767-22

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.75	pg/g	0.157		
18 - 2,2',5-Trichlorobiphenyl	14.4	pg/g	0.0871	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	30.5	pg/g	0.073	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	208	pg/g	0.0224	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	191	pg/g	0.0181	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	647	pg/g	0.0197		
66 - 2,3',4,4'-Tetrachlorobiphenyl	206	pg/g	0.684		
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.37	pg/g	0.884		
87 - 2,2',3,4,5-Pentachlorobiphenyl	969	pg/g	0.331	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1690	pg/g	0.284	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	615	pg/g	5.75	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	1810	pg/g	5.17	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.05	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	356	pg/g	0.886	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2240	pg/g	0.847	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2340	pg/g	0.735	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	199	pg/g	0.346		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.71	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	196	pg/g	0.0496	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	577	pg/g	0.0424	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	219	pg/g	0.0531	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.99	pg/g	0.0365		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	493	pg/g	0.0378		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	26.2	pg/g	0.161		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	131	pg/g	0.0795		
209 - Decachlorobiphenyl	14.4	pg/g	0.0262		

SLC
10-8-01

Sample Results

Sample FS-11-VS-T

Fish: Vermilion Snapper

Lab ID L2767-23

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	14.5	pg/g	1.52		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1980	pg/g	12.8	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	110	pg/g	13		
118 - 2,3',4,4',5-Pentachlorobiphenyl	5060	pg/g	10.3	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	81.9	pg/g	12.8		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.03	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	618	pg/g	0.541		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	128	pg/g	0.496		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	207	pg/g	1.3		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.63	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	274	pg/g	0.031	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	616	pg/g	0.0265	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	14.3	pg/g	0.19		

SLC
10-8-01

Sample Results

Sample FS-11-VS-T

Fish: Vermilion Snapper

Lab ID L2767-23

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	1.27	U	RB-I
Total Dichlorobiphenyls	20.7	pg/g	0.393		
Total Trichlorobiphenyls	181	pg/g	0.204		
Total Tetrachlorobiphenyls	3600	pg/g	1.52		
Total Pentachlorobiphenyls	21700	pg/g	14.1		
Total Hexachlorobiphenyls	15700	pg/g	2.19		
Total Heptachlorobiphenyls	1990	pg/g	0.19		
Total Octachlorobiphenyls	384	pg/g	0.0982		
Total Nonachlorobiphenyls	66.9	pg/g	0.101		
209 - Decachlorobiphenyl	4.53	pg/g	0.0214		
Total Polychlorinated Biphenyls	43600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-11-VS-T

Fish: Vermilion Snapper

Lab ID L2767-23

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.94	pg/g	0.239		
18 - 2,2',5-Trichlorobiphenyl	29.9	pg/g	0.0923	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	28.8	pg/g	0.133	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	228	pg/g	0.029	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	258	pg/g	0.0234	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	798	pg/g	0.0255		
66 - 2,3',4,4'-Tetrachlorobiphenyl	460	pg/g	1.2		
77 - 3,3',4,4'-Tetrachlorobiphenyl	14.5	pg/g	1.52		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1860	pg/g	0.171	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	4280	pg/g	0.147	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1980	pg/g	12.8	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	5060	pg/g	10.3	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.03	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	768	pg/g	1.75	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5030	pg/g	1.68	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	3900	pg/g	1.45	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	618	pg/g	0.541		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.63	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	274	pg/g	0.031	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	616	pg/g	0.0265	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	213	pg/g	0.0331	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.83	pg/g	0.0228		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	305	pg/g	0.0236		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	19.2	pg/g	0.0968		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	44.8	pg/g	0.101		
209 - Decachlorobiphenyl	4.53	pg/g	0.0214		

SLC
10-8-01

Sample Results

Sample FS-12-VS-T

Fish: Vermilion Snapper

Lab ID L2767-24 i

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	2.47	pg/g	0.33		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	86.7	pg/g	0.869	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	5	pg/g	0.808		
118 - 2,3',4,4',5-Pentachlorobiphenyl	234	pg/g	0.801	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	3.35	pg/g	0.922		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.861	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	29.5	pg/g	0.304		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.15	pg/g	0.279		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	12.6	pg/g	0.223		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.249	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	26.9	pg/g	0.0443	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	71.6	pg/g	0.0378	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.69	pg/g	0.0548		

SLC
10-8-01

Sample Results

Sample FS-12-VS-T

Fish: Vermilion Snapper

Lab ID L2767-24 i

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.567	U	MB, RB-I
Total Dichlorobiphenyls	5.39	pg/g	0.178		
Total Trichlorobiphenyls	36.7	pg/g	0.0818		
Total Tetrachlorobiphenyls	239	pg/g	0.33		
Total Pentachlorobiphenyls	1150	pg/g	0.922		
Total Hexachlorobiphenyls	1070	pg/g	0.359		
Total Heptachlorobiphenyls	268	pg/g	0.0555		
Total Octachlorobiphenyls	103	pg/g	0.0266		
Total Nonachlorobiphenyls	33.1	pg/g	0.0741		
209 - Decachlorobiphenyl	3.35	pg/g	0.0237		
Total Polychlorinated Biphenyls	2910	pg/g			

SLC
10-8-01

Sample Results

Sample FS-12-VS-T Fish: Vermilion Snapper

Lab ID L2767-24 i Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.51	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	6.19	pg/g	0.0559	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	6.91	pg/g	0.0538	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	26.6	pg/g	0.0377	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	20	pg/g	0.0304	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	59.7	pg/g	0.0332		
66 - 2,3',4,4'-Tetrachlorobiphenyl	23.6	pg/g	0.258		
77 - 3,3',4,4'-Tetrachlorobiphenyl	2.47	pg/g	0.33		
87 - 2,2',3,4,5-Pentachlorobiphenyl	112	pg/g	0.171	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	205	pg/g	0.147	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	86.7	pg/g	0.869	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	234	pg/g	0.801	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.861	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	50.5	pg/g	0.287	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	298	pg/g	0.274	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	305	pg/g	0.238	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	29.5	pg/g	0.304		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.249	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	26.9	pg/g	0.0443	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	71.6	pg/g	0.0378	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	27.9	pg/g	0.0474	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.9	pg/g	0.0325		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	62.3	pg/g	0.0337		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.91	pg/g	0.0262		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	21	pg/g	0.0741		
209 - Decachlorobiphenyl	3.35	pg/g	0.0237		

SLC
10-8-01

Sample Results

Sample FS-13-VS-T

Fish: Vermilion Snapper

Lab ID L2767-25

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.19	pg/g	0.453		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	293	pg/g	2.2	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	15.8	pg/g	2.24		
118 - 2,3',4,4',5-Pentachlorobiphenyl	793	pg/g	2.13	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	10.3	pg/g	2.37		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.22	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	77.2	pg/g	0.449		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	18.9	pg/g	0.411		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	32.1	pg/g	0.51		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.554	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	65.9	pg/g	0.0262	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	179	pg/g	0.0223	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.46	pg/g	0.0871		

SLC
10-8-01

Sample Results

Sample FS-13-VS-T

Fish: Vermilion Snapper

Lab ID L2767-25

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.72	pg/g	0.14		
Total Dichlorobiphenyls	18.9	pg/g	0.261		
Total Trichlorobiphenyls	155	pg/g	0.125		
Total Tetrachlorobiphenyls	1180	pg/g	0.453		
Total Pentachlorobiphenyls	4380	pg/g	2.43		
Total Hexachlorobiphenyls	3150	pg/g	0.83		
Total Heptachlorobiphenyls	681	pg/g	0.0871		
Total Octachlorobiphenyls	205	pg/g	0.0747		
Total Nonachlorobiphenyls	57.1	pg/g	0.0697		
209 - Decachlorobiphenyl	5.17	pg/g	0.0139		
Total Polychlorinated Biphenyls	9830	pg/g			

SLC
10-8-01

Sample Results

Sample FS-13-VS-T Fish: Vermilion Snapper

Lab ID L2767-25 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.23	pg/g	0.149		
18 - 2,2',5-Trichlorobiphenyl	27.6	pg/g	0.0972	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	25	pg/g	0.0778	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	130	pg/g	0.0254	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	97.1	pg/g	0.0205	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	337	pg/g	0.0224		
66 - 2,3',4,4'-Tetrachlorobiphenyl	101	pg/g	0.359		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.19	pg/g	0.453		
87 - 2,2',3,4,5-Pentachlorobiphenyl	478	pg/g	0.424	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	731	pg/g	0.363	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	293	pg/g	2.2	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	793	pg/g	2.13	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.22	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	144	pg/g	0.663	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	907	pg/g	0.634	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	847	pg/g	0.55	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	77.2	pg/g	0.449		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.554	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	65.9	pg/g	0.0262	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	179	pg/g	0.0223	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	71.8	pg/g	0.028	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.92	pg/g	0.0192		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	158	pg/g	0.0199		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.88	pg/g	0.0736		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	36.2	pg/g	0.0697		
209 - Decachlorobiphenyl	5.17	pg/g	0.0139		

SLC
10-8-01

Sample Results

Sample FS-15-VS-T

Fish: Vermilion Snapper

Lab ID L2767-26 (A)

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.6	pg/g	0.672		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	602	pg/g	4.5	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	32.8	pg/g	4.59		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1660	pg/g	4.28	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	20.4	pg/g	4.94		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.65	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	159	pg/g	0.316		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	36.1	pg/g	0.289		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	67.9	pg/g	0.644		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.704	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	145	pg/g	0.0322	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	391	pg/g	0.0275	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	7.17	pg/g	0.108		

SLC
10-8-01

Sample Results

Sample FS-15-VS-T

Fish: Vermilion Snapper

Lab ID L2767-26 (A)

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.65	pg/g	0.112		
Total Dichlorobiphenyls	24.6	pg/g	0.232		
Total Trichlorobiphenyls	218	pg/g	0.174		
Total Tetrachlorobiphenyls	2080	pg/g	0.672		
Total Pentachlorobiphenyls	8700	pg/g	5		
Total Hexachlorobiphenyls	6430	pg/g	1.05		
Total Heptachlorobiphenyls	1420	pg/g	0.108		
Total Octachlorobiphenyls	480	pg/g	0.107		
Total Nonachlorobiphenyls	146	pg/g	0.0857		
209 - Decachlorobiphenyl	12.5	pg/g	0.0167		
Total Polychlorinated Biphenyls	19500	pg/g			

SLC
10-8-01

Sample Results

Sample FS-15-VS-T Fish: Vermilion Snapper

Lab ID L2767-26 (A) Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.82	pg/g	0.141		
18 - 2,2',5-Trichlorobiphenyl	40.9	pg/g	0.0692	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	33.1	pg/g	0.114	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	205	pg/g	0.0217	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	178	pg/g	0.0175	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	598	pg/g	0.0191		
66 - 2,3',4,4'-Tetrachlorobiphenyl	190	pg/g	0.535		
77 - 3,3',4,4'-Tetrachlorobiphenyl	9.6	pg/g	0.672		
87 - 2,2',3,4,5-Pentachlorobiphenyl	943	pg/g	0.169	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1500	pg/g	0.145	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	602	pg/g	4.5	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	1660	pg/g	4.28	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.65	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	303	pg/g	0.84	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1840	pg/g	0.803	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1810	pg/g	0.697	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	159	pg/g	0.316		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.704	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	145	pg/g	0.0322	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	391	pg/g	0.0275	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	150	pg/g	0.0344	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.46	pg/g	0.0236		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	335	pg/g	0.0245		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	14.2	pg/g	0.106		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	95.3	pg/g	0.0857		
209 - Decachlorobiphenyl	12.5	pg/g	0.0167		

SLC
10-8-01

Sample Results

Sample FS-16-VS-T

Fish: Vermilion Snapper

Lab ID L2767-27

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.81	pg/g	0.817		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	273	pg/g	2.54	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	14.6	pg/g	2.59		
118 - 2,3',4,4',5-Pentachlorobiphenyl	755	pg/g	2.49	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	10.8	pg/g	2.74		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.53	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	74	pg/g	0.341		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	18.8	pg/g	0.313		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	32.1	pg/g	0.457		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.48	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.1	pg/g	0.0304	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	179	pg/g	0.0259	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.3	pg/g	0.0879		

SLC
10-8-01

Sample Results

Sample FS-16-VS-T

Fish: Vermilion Snapper

Lab ID L2767-27

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.88	pg/g	0.155		
Total Dichlorobiphenyls	19.3	pg/g	0.256		
Total Trichlorobiphenyls	140	pg/g	0.142		
Total Tetrachlorobiphenyls	1020	pg/g	0.817		
Total Pentachlorobiphenyls	3930	pg/g	2.84		
Total Hexachlorobiphenyls	3050	pg/g	0.742		
Total Heptachlorobiphenyls	666	pg/g	0.0879		
Total Octachlorobiphenyls	200	pg/g	0.0363		
Total Nonachlorobiphenyls	52	pg/g	0.13		
209 - Decachlorobiphenyl	5.52	pg/g	0.0199		
Total Polychlorinated Biphenyls	9080	pg/g			

SLC
10-8-01

Sample Results

Sample FS-16-VS-T

Fish: Vermilion Snapper

Lab ID L2767-27

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.88	pg/g	0.154		
18 - 2,2',5-Trichlorobiphenyl	26	pg/g	0.0654	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	20	pg/g	0.0913	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	123	pg/g	0.0336	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	86.1	pg/g	0.0271	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	281	pg/g	0.0296		
66 - 2,3',4,4'-Tetrachlorobiphenyl	90.8	pg/g	0.654		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.81	pg/g	0.817		
87 - 2,2',3,4,5-Pentachlorobiphenyl	414	pg/g	0.411	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	659	pg/g	0.352	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	273	pg/g	2.54	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	755	pg/g	2.49	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.53	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	151	pg/g	0.593	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	860	pg/g	0.567	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	832	pg/g	0.492	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	74	pg/g	0.341		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.48	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.1	pg/g	0.0304	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	179	pg/g	0.0259	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	68.8	pg/g	0.0325	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.78	pg/g	0.0223		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	151	pg/g	0.0231		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.36	pg/g	0.0358		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	32.9	pg/g	0.13		
209 - Decachlorobiphenyl	5.52	pg/g	0.0199		

SLC
10-8-01

Sample Results

Sample FS-17-VS-T

Fish: Vermilion Snapper

Lab ID L2767-28

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.57	pg/g	1.94		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	404	pg/g	3.62	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	21	pg/g	3.42		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1120	pg/g	3.18	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	14.5	pg/g	3.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.78	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	114	pg/g	0.342		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	26.9	pg/g	0.314		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	45.9	pg/g	0.542		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.641	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80	pg/g	0.0359	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	219	pg/g	0.0307	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.25	pg/g	0.107		

SLC
10-8-01

Sample Results

Sample FS-17-VS-T

Fish: Vermilion Snapper

Lab ID L2767-28

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.67	pg/g	0.187		
Total Dichlorobiphenyls	24.4	pg/g	0.223		
Total Trichlorobiphenyls	190	pg/g	0.139		
Total Tetrachlorobiphenyls	1450	pg/g	1.94		
Total Pentachlorobiphenyls	5550	pg/g	3.78		
Total Hexachlorobiphenyls	4240	pg/g	0.912		
Total Heptachlorobiphenyls	834	pg/g	0.107		
Total Octachlorobiphenyls	251	pg/g	0.0482		
Total Nonachlorobiphenyls	61.9	pg/g	0.0819		
209 - Decachlorobiphenyl	5.04	pg/g	0.0225		
Total Polychlorinated Biphenyls	12600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-17-VS-T

Fish: Vermilion Snapper

Lab ID L2767-28

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.15	pg/g	0.143		
18 - 2,2',5-Trichlorobiphenyl	38.3	pg/g	0.0802	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	26.2	pg/g	0.0884	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	157	pg/g	0.0284	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	126	pg/g	0.023	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	409	pg/g	0.025		
66 - 2,3',4,4'-Tetrachlorobiphenyl	128	pg/g	1.54		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.57	pg/g	1.94		
87 - 2,2',3,4,5-Pentachlorobiphenyl	564	pg/g	0.335	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	985	pg/g	0.287	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	404	pg/g	3.62	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	1120	pg/g	3.18	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.78	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	184	pg/g	0.728	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1220	pg/g	0.696	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1160	pg/g	0.604	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	114	pg/g	0.342		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.641	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80	pg/g	0.0359	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	219	pg/g	0.0307	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	87	pg/g	0.0384	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.11	pg/g	0.0264		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	196	pg/g	0.0273		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.97	pg/g	0.0475		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	39.5	pg/g	0.0819		
209 - Decachlorobiphenyl	5.04	pg/g	0.0225		

SLC
10-8-01

Sample Results

Sample FS-18-VS-T

Fish: Vermilion Snapper

Lab ID L2767-29

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.6	pg/g	0.97		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	292	pg/g	2.63	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	14.8	pg/g	2.66		
118 - 2,3',4,4',5-Pentachlorobiphenyl	801	pg/g	2.53	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	11	pg/g	2.86		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.74	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.2	pg/g	0.559		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	21.4	pg/g	0.513		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	37.9	pg/g	0.308		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.334	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	73.5	pg/g	0.0381	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	195	pg/g	0.0325	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.65	pg/g	0.126		

SLC
10-8-01

Sample Results

Sample FS-18-VS-T

Fish: Vermilion Snapper

Lab ID L2767-29

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.28	pg/g	0.165		
Total Dichlorobiphenyls	16.2	pg/g	0.199		
Total Trichlorobiphenyls	128	pg/g	0.104		
Total Tetrachlorobiphenyls	986	pg/g	0.972		
Total Pentachlorobiphenyls	4020	pg/g	2.95		
Total Hexachlorobiphenyls	3220	pg/g	0.497		
Total Heptachlorobiphenyls	678	pg/g	0.126		
Total Octachlorobiphenyls	211	pg/g	0.0548		
Total Nonachlorobiphenyls	54	pg/g	0.0953		
209 - Decachlorobiphenyl	4.42	pg/g	0.0243		
Total Polychlorinated Biphenyls	9320	pg/g			

SLC
10-8-01

Sample Results

Sample FS-18-VS-T Fish: Vermilion Snapper

Lab ID L2767-29 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.78	pg/g	0.117		
18 - 2,2',5-Trichlorobiphenyl	22.9	pg/g	0.0641	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	20.1	pg/g	0.0716	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	110	pg/g	0.0273	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	82	pg/g	0.0221	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	276	pg/g	0.024		
66 - 2,3',4,4'-Tetrachlorobiphenyl	92.4	pg/g	0.793		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.6	pg/g	0.97		
87 - 2,2',3,4,5-Pentachlorobiphenyl	410	pg/g	0.447	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	668	pg/g	0.383	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	292	pg/g	2.63	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	801	pg/g	2.53	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.74	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	170	pg/g	0.397	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	909	pg/g	0.38	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	922	pg/g	0.329	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.2	pg/g	0.559		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.334	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	73.5	pg/g	0.0381	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	195	pg/g	0.0325	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	74.2	pg/g	0.0407	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.81	pg/g	0.028		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	145	pg/g	0.029		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.62	pg/g	0.0541		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	36.3	pg/g	0.0953		
209 - Decachlorobiphenyl	4.42	pg/g	0.0243		

SLC
10-8-01

Sample Results

Sample FS-20-VS-T

Fish: Vermilion Snapper

Lab ID L2767-30

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.47	pg/g	1.01		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	261	pg/g	2.39	J	MS-H
114 - 2,3,4,4',5-Pentachlorobiphenyl	13.1	pg/g	2.34		
118 - 2,3',4,4',5-Pentachlorobiphenyl	735	pg/g	2.27	J	MS-H
123 - 2',3,4,4',5-Pentachlorobiphenyl	9.53	pg/g	2.48		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.49	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.2	pg/g	0.516		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	20.6	pg/g	0.474		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	35.8	pg/g	0.588		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.641	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	85.1	pg/g	0.0493	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	236	pg/g	0.0421	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.46	pg/g	0.0883		

SLC
10-8-01

Sample Results

Sample FS-20-VS-T

Fish: Vermilion Snapper

Lab ID L2767-30

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	1.14	U	MB, RB-I
Total Dichlorobiphenyls	15.3	pg/g	0.253		
Total Trichlorobiphenyls	117	pg/g	0.138		
Total Tetrachlorobiphenyls	852	pg/g	1.01		
Total Pentachlorobiphenyls	3710	pg/g	2.59		
Total Hexachlorobiphenyls	3330	pg/g	0.962		
Total Heptachlorobiphenyls	865	pg/g	0.0883		
Total Octachlorobiphenyls	286	pg/g	0.0631		
Total Nonachlorobiphenyls	81	pg/g	0.0932		
209 - Decachlorobiphenyl	6.09	pg/g	0.0251		
Total Polychlorinated Biphenyls	9260	pg/g			

SLC
10-8-01

Sample Results

Sample FS-20-VS-T Fish: Vermilion Snapper

Lab ID L2767-30 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.17	pg/g	0.151		
18 - 2,2',5-Trichlorobiphenyl	21.8	pg/g	0.0656	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	18.5	pg/g	0.0901	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	95.8	pg/g	0.0494	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	72.3	pg/g	0.0399	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	229	pg/g	0.0435		
66 - 2,3',4,4'-Tetrachlorobiphenyl	77.6	pg/g	0.796		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.47	pg/g	1.01		
87 - 2,2',3,4,5-Pentachlorobiphenyl	390	pg/g	0.331	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	632	pg/g	0.284	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	261	pg/g	2.39	J	MS-H
118 - 2,3',4,4',5-Pentachlorobiphenyl	735	pg/g	2.27	J	MS-H
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.49	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	150	pg/g	0.768	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	941	pg/g	0.735	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	960	pg/g	0.637	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.2	pg/g	0.516		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.641	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	85.1	pg/g	0.0493	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	236	pg/g	0.0421	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	96.1	pg/g	0.0527	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.07	pg/g	0.0362		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	200	pg/g	0.0375		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	8.97	pg/g	0.0623		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	53.7	pg/g	0.0932		
209 - Decachlorobiphenyl	6.09	pg/g	0.0251		

SLC
10-8-01

Sample Results

Sample FS-01-WG-R

Fish: White Grunt

Lab ID L2767-31

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.35	pg/g	1.24		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	486	pg/g	2.71		
114 - 2,3,4,4',5-Pentachlorobiphenyl	28.9	pg/g	2.68		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1520	pg/g	2.56		
123 - 2',3,4,4',5-Pentachlorobiphenyl	12.8	pg/g	2.9		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.78	pg/g	2.9		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	197	pg/g	0.574		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	50	pg/g	0.526		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	84.9	pg/g	0.245		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.26	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	219	pg/g	0.0521	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	615	pg/g	0.0454	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	13.1	pg/g	0.252		

SLC
10-8-01

Sample Results

Sample FS-01-WG-R

Fish: White Grunt

Lab ID L2767-31

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	1.83	U	MB-I
Total Dichlorobiphenyls	8.61	pg/g	0.361		
Total Trichlorobiphenyls	62.4	pg/g	0.0659		
Total Tetrachlorobiphenyls	393	pg/g	1.24		
Total Pentachlorobiphenyls	3540	pg/g	2.9		
Total Hexachlorobiphenyls	6020	pg/g	0.374		
Total Heptachlorobiphenyls	1640	pg/g	0.252		
Total Octachlorobiphenyls	742	pg/g	0.155		
Total Nonachlorobiphenyls	330	pg/g	0.249		
209 - Decachlorobiphenyl	56.7	pg/g	0.0416		
Total Polychlorinated Biphenyls	12800	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-WG-R Fish: White Grunt

Lab ID L2767-31 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.8	pg/g	0.212		
18 - 2,2',5-Trichlorobiphenyl	1.91	pg/g	0.0493	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	24.6	pg/g	0.0233	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	46.1	pg/g	0.0419	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	18.8	pg/g	0.0336	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	36.2	pg/g	0.0365		
66 - 2,3',4,4'-Tetrachlorobiphenyl	83.5	pg/g	0.884		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.35	pg/g	1.24		
87 - 2,2',3,4,5-Pentachlorobiphenyl	126	pg/g	0.0874	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	298	pg/g	0.0741	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	486	pg/g	2.71		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1520	pg/g	2.56		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.78	pg/g	2.9		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	298	pg/g	0.294	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1870	pg/g	0.284	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2630	pg/g	0.246	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	197	pg/g	0.574		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.26	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	219	pg/g	0.0521	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	615	pg/g	0.0454	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	203	pg/g	0.0564	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.01	pg/g	0.0406		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	353	pg/g	0.0397		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	29.1	pg/g	0.155		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	203	pg/g	0.249		
209 - Decachlorobiphenyl	56.7	pg/g	0.0416		

SLC
10-8-01

Sample Results

Sample FS-02-WG-R

Fish: White Grunt

Lab ID L2767-32

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.07	pg/g	0.293		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	95.2	pg/g	0.875		
114 - 2,3,4,4',5-Pentachlorobiphenyl	6.28	pg/g	0.928		
118 - 2,3',4,4',5-Pentachlorobiphenyl	305	pg/g	0.846		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.76	pg/g	0.997		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.12	U	ID(IR)-I
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	39.1	pg/g	0.231		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	12.8	pg/g	0.212		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	21.9	pg/g	0.117		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.135	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	58.2	pg/g	0.0349	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	159	pg/g	0.0304	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.96	pg/g	0.0413		

SLC
10-8-01

Sample Results

Sample FS-02-WG-R

Fish: White Grunt

Lab ID L2767-32

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.613	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	3.9	U	MB-I
Total Trichlorobiphenyls	19.3	pg/g	0.0365		
Total Tetrachlorobiphenyls	94	pg/g	0.306		
Total Pentachlorobiphenyls	676	pg/g	0.997		
Total Hexachlorobiphenyls	1370	pg/g	0.194		
Total Heptachlorobiphenyls	416	pg/g	0.045		
Total Octachlorobiphenyls	212	pg/g	0.0375		
Total Nonachlorobiphenyls	134	pg/g	0.145		
209 - Decachlorobiphenyl	22.6	pg/g	0.027		
Total Polychlorinated Biphenyls	2950	pg/g			

SLC
10-8-07

Sample Results

Sample FS-02-WG-R

Fish: White Grunt

Lab ID L2767-32

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.49	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.21	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	6.32	pg/g	0.0136	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	19.2	pg/g	0.0287	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.11	pg/g	0.023	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	9.16	pg/g	0.025		
66 - 2,3',4,4'-Tetrachlorobiphenyl	16.2	pg/g	0.213		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.07	pg/g	0.293		
87 - 2,2',3,4,5-Pentachlorobiphenyl	26.6	pg/g	0.0349	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	48.2	pg/g	0.0296	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	95.2	pg/g	0.875		
118 - 2,3',4,4',5-Pentachlorobiphenyl	305	pg/g	0.846		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.12	U	ID(IR)-I
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	61.3	pg/g	0.153	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	422	pg/g	0.147	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	621	pg/g	0.128	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	39.1	pg/g	0.231		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.135	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	58.2	pg/g	0.0349	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	159	pg/g	0.0304	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	45.3	pg/g	0.0378	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.91	pg/g	0.0272		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	96.6	pg/g	0.0266		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.9	pg/g	0.0265		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	90.8	pg/g	0.145		
209 - Decachlorobiphenyl	22.6	pg/g	0.027		

SLC
10-8-01

Sample Results

Sample FS-03-WG-R

Fish: White Grunt

Lab ID L2767-33

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.704	pg/g	0.241		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	98	pg/g	0.773		
114 - 2,3,4,4',5-Pentachlorobiphenyl	6.38	pg/g	0.786		
118 - 2,3',4,4',5-Pentachlorobiphenyl	310	pg/g	0.76		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.53	pg/g	0.843		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.855	pg/g	0.784		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.2	pg/g	0.465		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	13.1	pg/g	0.426		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	19.5	pg/g	0.102		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.109	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	62	pg/g	0.0341	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	180	pg/g	0.0291	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.05	pg/g	0.042		

SLC
10-8-01

Sample Results

Sample FS-03-WG-R

Fish: White Grunt

Lab ID L2767-33

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.545	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	4.19	U	MB-I
Total Trichlorobiphenyls	21.2	pg/g	0.0487		
Total Tetrachlorobiphenyls	103	pg/g	0.241		
Total Pentachlorobiphenyls	815	pg/g	0.892		
Total Hexachlorobiphenyls	1500	pg/g	0.167		
Total Heptachlorobiphenyls	496	pg/g	0.0431		
Total Octachlorobiphenyls	227	pg/g	0.0503		
Total Nonachlorobiphenyls	92.1	pg/g	0.0635		
209 - Decachlorobiphenyl	16.1	pg/g	0.0268		
Total Polychlorinated Biphenyls	3280	pg/g			

SLC
10-8-01

Sample Results

Sample FS-03-WG-R Fish: White Grunt

Lab ID L2767-33 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.96	pg/g	0.208		
18 - 2,2',5-Trichlorobiphenyl	1.41	pg/g	0.0372	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	6.36	pg/g	0.0164	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	15	pg/g	0.0318	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	7.16	pg/g	0.0257	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	13.4	pg/g	0.0281		
66 - 2,3',4,4'-Tetrachlorobiphenyl	19.1	pg/g	0.187		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.704	pg/g	0.241		
87 - 2,2',3,4,5-Pentachlorobiphenyl	39.7	pg/g	0.0269	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	96.5	pg/g	0.0229	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	98	pg/g	0.773		
118 - 2,3',4,4',5-Pentachlorobiphenyl	310	pg/g	0.76		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.855	pg/g	0.784		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	72.2	pg/g	0.135	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	452	pg/g	0.126	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	663	pg/g	0.112	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.2	pg/g	0.465		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.109	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	62	pg/g	0.0341	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	180	pg/g	0.0291	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	55.2	pg/g	0.0359	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.07	pg/g	0.0244		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	119	pg/g	0.0255		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.56	pg/g	0.0503		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	57.3	pg/g	0.0635		
209 - Decachlorobiphenyl	16.1	pg/g	0.0268		

SLC
10-8-01

Sample Results

Sample FS-06-WG-R

Fish: White Grunt

Lab ID L2767-34

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.123	U	
105 - 2,3,3',4,4'-Pentachlorobiphenyl	29	pg/g	0.158		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.15	pg/g	0.155		
118 - 2,3',4,4',5-Pentachlorobiphenyl	85.2	pg/g	0.156		
123 - 2',3,4,4',5-Pentachlorobiphenyl	0.976	pg/g	0.17		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.296	pg/g	0.168		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	11.5	pg/g	0.219		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	3.23	pg/g	0.201		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	5.67	pg/g	0.0733		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.075	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	15.3	pg/g	0.028	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	42.8	pg/g	0.0244	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.21	pg/g	0.0186		

SLC
10-8-01

Sample Results

Sample FS-06-WG-R

Fish: White Grunt

Lab ID L2767-34

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.223	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	1.52	U	MB, RB-I
Total Trichlorobiphenyls	9.43	pg/g	0.0499		
Total Tetrachlorobiphenyls	32.3	pg/g	0.123		
Total Pentachlorobiphenyls	211	pg/g	0.17		
Total Hexachlorobiphenyls	363	pg/g	0.111		
Total Heptachlorobiphenyls	111	pg/g	0.0361		
Total Octachlorobiphenyls	53.4	pg/g	0.0376		
Total Nonachlorobiphenyls	43.1	pg/g	0.169		
209 - Decachlorobiphenyl	9.51	pg/g	0.0259		
Total Polychlorinated Biphenyls	834	pg/g			

SLC
10-8-01

Sample Results

Sample FS-06-WG-R Fish: White Grunt

Lab ID L2767-34 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.95	U	MB, RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.994	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.08	pg/g	0.0188	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	5.11	pg/g	0.0322	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.3	pg/g	0.0258	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	3.05	pg/g	0.028		
66 - 2,3',4,4'-Tetrachlorobiphenyl	6.31	pg/g	0.0855		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.123	U	
87 - 2,2',3,4,5-Pentachlorobiphenyl	8.18	pg/g	0.0339	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	23.8	pg/g	0.0288	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	29	pg/g	0.158		
118 - 2,3',4,4',5-Pentachlorobiphenyl	85.2	pg/g	0.156		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.296	pg/g	0.168		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	18	pg/g	0.0871	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	107	pg/g	0.0841	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	159	pg/g	0.0728	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	11.5	pg/g	0.219		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.075	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	15.3	pg/g	0.028	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	42.8	pg/g	0.0244	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	12.4	pg/g	0.0303	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.356	pg/g	0.0218		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	26.5	pg/g	0.0213		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.74	pg/g	0.0306		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	28.3	pg/g	0.169		
209 - Decachlorobiphenyl	9.51	pg/g	0.0259		

SLC
10-8-01

Sample Results

Sample FS-08-WG-R

Fish: White Grunt

Lab ID L2767-35

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.538	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	40.1	pg/g	0.348		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.54	pg/g	0.337		
118 - 2,3',4,4',5-Pentachlorobiphenyl	116	pg/g	0.343		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.1	pg/g	0.377		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.353	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	18.3	pg/g	0.268		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4.82	pg/g	0.245		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	8.52	pg/g	0.149		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.164	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	21.1	pg/g	0.028	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	62.3	pg/g	0.0244	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.58	pg/g	0.0215		

SLC
10-8-01

Sample Results

Sample FS-08-WG-R

Fish: White Grunt

Lab ID L2767-35

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.313	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	3.12	U	MB, RB-I
Total Trichlorobiphenyls	13.1	pg/g	0.0513		
Total Tetrachlorobiphenyls	52.1	pg/g	0.258		
Total Pentachlorobiphenyls	324	pg/g	0.377		
Total Hexachlorobiphenyls	535	pg/g	0.231		
Total Heptachlorobiphenyls	171	pg/g	0.0362		
Total Octachlorobiphenyls	95.4	pg/g	0.0322		
Total Nonachlorobiphenyls	46	pg/g	0.16		
209 - Decachlorobiphenyl	8.56	pg/g	0.0393		
Total Polychlorinated Biphenyls	1250	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-WG-R Fish: White Grunt

Lab ID L2767-35 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.41	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.28	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	4.11	pg/g	0.0102	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	7.71	pg/g	0.0295	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	4.18	pg/g	0.0237	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	8.22	pg/g	0.0257		
66 - 2,3',4,4'-Tetrachlorobiphenyl	9.17	pg/g	0.181		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.538	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	19.9	pg/g	0.0196	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	42.9	pg/g	0.0166	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	40.1	pg/g	0.348		
118 - 2,3',4,4',5-Pentachlorobiphenyl	116	pg/g	0.343		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.353	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	25.7	pg/g	0.182	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	150	pg/g	0.175	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	232	pg/g	0.152	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	18.3	pg/g	0.268		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.164	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	21.1	pg/g	0.028	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	62.3	pg/g	0.0244	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	20.5	pg/g	0.0304	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.597	pg/g	0.0219		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	43.1	pg/g	0.0213		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	3.69	pg/g	0.0322		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	27.9	pg/g	0.16		
209 - Decachlorobiphenyl	8.56	pg/g	0.0393		

SLC
10-8-01

Sample Results

Sample FS-09-WG-R

Fish: White Grunt

Lab ID L2767-36

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.195	U	
105 - 2,3,3',4,4'-Pentachlorobiphenyl	23.8	pg/g	0.26		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.31	pg/g	0.256		
118 - 2,3',4,4',5-Pentachlorobiphenyl	71.5	pg/g	0.248		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	0.553	U	ID(IR)-I
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.258	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	9.73	pg/g	0.171		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	2.92	pg/g	0.157		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	4.06	pg/g	0.0661		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.092	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	14.7	pg/g	0.03	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	35.5	pg/g	0.0256	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.831	pg/g	0.0178		

SLC
10-8-01

Sample Results

Sample FS-09-WG-R

Fish: White Grunt

Lab ID L2767-36

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.543	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	2.29	U	MB, RB-I
Total Trichlorobiphenyls	7.53	pg/g	0.0644		
Total Tetrachlorobiphenyls	26	pg/g	0.195		
Total Pentachlorobiphenyls	189	pg/g	0.298		
Total Hexachlorobiphenyls	335	pg/g	0.113		
Total Heptachlorobiphenyls	94.1	pg/g	0.038		
Total Octachlorobiphenyls	48.3	pg/g	0.0194		
Total Nonachlorobiphenyls	23.2	pg/g	0.0498		
209 - Decachlorobiphenyl	5.56	pg/g	0.0184		
Total Polychlorinated Biphenyls	732	pg/g			

Sec
10-8-01

Sample Results

Sample FS-09-WG-R Fish: White Grunt

Lab ID L2767-36 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.962	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.947	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.22	pg/g	0.042	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	4.27	pg/g	0.0237	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	1.58	pg/g	0.0192	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	3.19	pg/g	0.021		
66 - 2,3',4,4'-Tetrachlorobiphenyl	4.92	pg/g	0.152		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.195	U	
87 - 2,2',3,4,5-Pentachlorobiphenyl	9.92	pg/g	0.0356	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	20.7	pg/g	0.0303	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	23.8	pg/g	0.26		
118 - 2,3',4,4',5-Pentachlorobiphenyl	71.5	pg/g	0.248		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.258	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	17.1	pg/g	0.0914	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	102	pg/g	0.0853	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	147	pg/g	0.0757	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	9.73	pg/g	0.171		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.092	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	14.7	pg/g	0.03	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	35.5	pg/g	0.0256	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	11.9	pg/g	0.0316	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.227	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	22.9	pg/g	0.0224		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.22	pg/g	0.0194		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	14.9	pg/g	0.0498		
209 - Decachlorobiphenyl	5.56	pg/g	0.0184		

SLC
10-8-01

Sample Results

Sample FS-10-WG-R

Fish: White Grunt

Lab ID L2767-37

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.444	pg/g	0.203		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	38.3	pg/g	0.321		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.03	pg/g	0.317		
118 - 2,3',4,4',5-Pentachlorobiphenyl	113	pg/g	0.308		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.17	pg/g	0.326		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.371	U	ID(IR)-I
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	15.4	pg/g	0.245		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4.77	pg/g	0.225		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	6.86	pg/g	0.116		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.126	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	20.8	pg/g	0.0213	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	56.5	pg/g	0.0182	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.31	pg/g	0.0136		

SLC
10-8-01

Sample Results

Sample FS-10-WG-R

Fish: White Grunt

Lab ID L2767-37

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.609	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	2.91	U	MB, RB-I
Total Trichlorobiphenyls	12.7	pg/g	0.0687		
Total Tetrachlorobiphenyls	46.6	pg/g	0.204		
Total Pentachlorobiphenyls	303	pg/g	0.363		
Total Hexachlorobiphenyls	515	pg/g	0.193		
Total Heptachlorobiphenyls	160	pg/g	0.027		
Total Octachlorobiphenyls	78.2	pg/g	0.0206		
Total Nonachlorobiphenyls	40.4	pg/g	0.0431		
209 - Decachlorobiphenyl	9.45	pg/g	0.0163		
Total Polychlorinated Biphenyls	1170	pg/g			

SEC
10-8-07

Sample Results

Sample FS-10-WG-R Fish: White Grunt

Lab ID L2767-37 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.22	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.31	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.58	pg/g	0.0449	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	7.23	pg/g	0.0184	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.99	pg/g	0.0149	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	4.86	pg/g	0.0163		
66 - 2,3',4,4'-Tetrachlorobiphenyl	8.91	pg/g	0.16		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.444	pg/g	0.203		
87 - 2,2',3,4,5-Pentachlorobiphenyl	15.2	pg/g	0.0174	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	39.5	pg/g	0.0148	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	38.3	pg/g	0.321		
118 - 2,3',4,4',5-Pentachlorobiphenyl	113	pg/g	0.308		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.371	U	ID(IR)-I
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	27	pg/g	0.156	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	156	pg/g	0.146	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	221	pg/g	0.13	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	15.4	pg/g	0.245		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.126	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	20.8	pg/g	0.0213	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	56.5	pg/g	0.0182	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	18.3	pg/g	0.0224	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.361	pg/g	0.0153		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	40.3	pg/g	0.0159		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	3.16	pg/g	0.0206		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	25.5	pg/g	0.0431		
209 - Decachlorobiphenyl	9.45	pg/g	0.0163		

SLC
10-8-02

Sample Results

Sample FS-12-WG-R

Fish: White Grunt

Lab ID L2767-38

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.277	pg/g	0.236		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	53.9	pg/g	0.433		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.2	pg/g	0.439		
118 - 2,3',4,4',5-Pentachlorobiphenyl	176	pg/g	0.421		
123 - 2',3,4,4',5-Pentachlorobiphenyl	0.568	pg/g	0.461		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.445	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	24.2	pg/g	0.198		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	9.17	pg/g	0.182		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	6.32	pg/g	0.0797		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0877	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	52.8	pg/g	0.0157	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	108	pg/g	0.0134	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.79	pg/g	0.0447		

SLC
10-8-01

Sample Results

Sample FS-12-WG-R

Fish: White Grunt

Lab ID L2767-38

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.4	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	0.92	U	MB, RB-I
Total Trichlorobiphenyls	5.78	pg/g	0.0227		
Total Tetrachlorobiphenyls	40.8	pg/g	0.242		
Total Pentachlorobiphenyls	423	pg/g	0.499		
Total Hexachlorobiphenyls	966	pg/g	0.132		
Total Heptachlorobiphenyls	264	pg/g	0.0447		
Total Octachlorobiphenyls	106	pg/g	0.019		
Total Nonachlorobiphenyls	37.8	pg/g	0.037		
209 - Decachlorobiphenyl	9.1	pg/g	0.0141		
Total Polychlorinated Biphenyls	1850	pg/g			

SLC
10-8-01

Sample Results

Sample FS-12-WG-R Fish: White Grunt

Lab ID L2767-38 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.55	U	MB, RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.488	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	1.79	pg/g	0.0145	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	7.16	pg/g	0.02	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.73	pg/g	0.0162	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	5.86	pg/g	0.0177		
66 - 2,3',4,4'-Tetrachlorobiphenyl	5.57	pg/g	0.189		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.277	pg/g	0.236		
87 - 2,2',3,4,5-Pentachlorobiphenyl	19.2	pg/g	0.015	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	53	pg/g	0.0127	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	53.9	pg/g	0.433		
118 - 2,3',4,4',5-Pentachlorobiphenyl	176	pg/g	0.421		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.445	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	50.6	pg/g	0.107	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	300	pg/g	0.1	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	462	pg/g	0.0888	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	24.2	pg/g	0.198		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0877	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	52.8	pg/g	0.0157	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	108	pg/g	0.0134	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	35.9	pg/g	0.0165	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.73	pg/g	0.0113		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	32.9	pg/g	0.0118		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.09	pg/g	0.0185		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	22.5	pg/g	0.037		
209 - Decachlorobiphenyl	9.1	pg/g	0.0141		

SLC
10-8-01

Sample Results

Sample FS-13-WG-R

Fish: White Grunt

Lab ID L2767-39 (A)

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.767	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	146	pg/g	1.2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	8.99	pg/g	1.21		
118 - 2,3',4,4',5-Pentachlorobiphenyl	526	pg/g	1.14		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.91	pg/g	1.31		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.2	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.1	pg/g	0.281		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.9	pg/g	0.258		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	28.7	pg/g	0.104		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.113	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	79.2	pg/g	0.0209	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	193	pg/g	0.0178	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.86	pg/g	0.0488		

SLC
10-8-02

Sample Results

Sample FS-13-WG-R

Fish: White Grunt

Lab ID L2767-39 (A)

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.192	U	
Total Dichlorobiphenyls	ND	pg/g	0.753	U	
Total Trichlorobiphenyls	10.2	pg/g	0.0758		
Total Tetrachlorobiphenyls	69.4	pg/g	0.167		
Total Pentachlorobiphenyls	1020	pg/g	1.43		
Total Hexachlorobiphenyls	1920	pg/g	0.175		
Total Heptachlorobiphenyls	424	pg/g	0.0488		
Total Octachlorobiphenyls	138	pg/g	0.0314		
Total Nonachlorobiphenyls	58	pg/g	0.0435		
209 - Decachlorobiphenyl	11	pg/g	0.0183		
Total Polychlorinated Biphenyls	3650	pg/g			

SLC
10-8-02

Sample Results

Sample FS-13-WG-R Fish: White Grunt

Lab ID L2767-39 (A) Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.808	U	ID(IR),MB,RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.695	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.48	pg/g	0.0256	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	9.57	pg/g	0.0172	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	1.98	pg/g	0.0139	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	3.04	pg/g	0.0152		
66 - 2,3',4,4'-Tetrachlorobiphenyl	18.9	pg/g	0.131		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.767	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	16.4	pg/g	0.0169	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	46	pg/g	0.0144	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	146	pg/g	1.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	526	pg/g	1.14		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.2	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	110	pg/g	0.142	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	631	pg/g	0.133	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	892	pg/g	0.118	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.1	pg/g	0.281		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.113	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	79.2	pg/g	0.0209	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	193	pg/g	0.0178	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	61.6	pg/g	0.0219	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.553	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	39.2	pg/g	0.0156		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.72	pg/g	0.0314		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	39.8	pg/g	0.0435		
209 - Decachlorobiphenyl	11	pg/g	0.0183		

SLC
10-8-01

Sample Results

Sample FS-14-WG-R

Fish: White Grunt

Lab ID L2767-40

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.331	pg/g	0.108		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	30.6	pg/g	0.309		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.92	pg/g	0.323		
118 - 2,3',4,4',5-Pentachlorobiphenyl	92.7	pg/g	0.297		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	0.73	U	ID(IR)-I
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.447	U	ID(IR)-I
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	12.9	pg/g	0.219		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4.45	pg/g	0.201		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	5.82	pg/g	0.0661		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0744	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	20	pg/g	0.0233	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	46.1	pg/g	0.0199	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.6	pg/g	0.0242		

SLC
10-8-01

Sample Results

Sample FS-14-WG-R

Fish: White Grunt

Lab ID L2767-40

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.268	U	MB, RB-I
Total Dichlorobiphenyls	ND	pg/g	0.92	U	MB, RB-I
Total Trichlorobiphenyls	5.09	pg/g	0.0563		
Total Tetrachlorobiphenyls	30.8	pg/g	0.113		
Total Pentachlorobiphenyls	231	pg/g	0.359		
Total Hexachlorobiphenyls	381	pg/g	0.115		
Total Heptachlorobiphenyls	110	pg/g	0.0294		
Total Octachlorobiphenyls	49.6	pg/g	0.0276		
Total Nonachlorobiphenyls	24.2	pg/g	0.0556		
209 - Decachlorobiphenyl	5.45	pg/g	0.0256		
Total Polychlorinated Biphenyls	838	pg/g			

SLC
10-8-01

Sample Results

Sample FS-14-WG-R Fish: White Grunt

Lab ID L2767-40 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.515	U	MB, RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.395	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	1.78	pg/g	0.0217	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	3.93	pg/g	0.0287	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	1.75	pg/g	0.0232	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	2.88	pg/g	0.0254		
66 - 2,3',4,4'-Tetrachlorobiphenyl	5.76	pg/g	0.0884		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.331	pg/g	0.108		
87 - 2,2',3,4,5-Pentachlorobiphenyl	11.9	pg/g	0.0188	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	27.2	pg/g	0.0159	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	30.6	pg/g	0.309		
118 - 2,3',4,4',5-Pentachlorobiphenyl	92.7	pg/g	0.297		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.447	U	ID(IR)-I
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	20.2	pg/g	0.0931	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	116	pg/g	0.087	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	167	pg/g	0.0772	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	12.9	pg/g	0.219		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0744	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	20	pg/g	0.0233	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	46.1	pg/g	0.0199	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	15.7	pg/g	0.0244	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.394	pg/g	0.0166		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	15.2	pg/g	0.0174		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.85	pg/g	0.0268		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	15.8	pg/g	0.0556		
209 - Decachlorobiphenyl	5.45	pg/g	0.0256		

SLC 10-8-01
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SLC

Sample Results

Sample FS-16-WG-R

Fish: White Grunt

Lab ID L2767-41

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.946	pg/g	0.198		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	47.7	pg/g	0.374		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.45	pg/g	0.363		
118 - 2,3',4,4',5-Pentachlorobiphenyl	142	pg/g	0.363		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.96	pg/g	0.395		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.636	pg/g	0.351		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	19.2	pg/g	0.212		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	5.36	pg/g	0.195		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	9.83	pg/g	0.236		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.211	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	23.9	pg/g	0.071	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	74.3	pg/g	0.0642	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.75	pg/g	0.065		

SLC
10-8-01

Sample Results

Sample FS-16-WG-R

Fish: White Grunt

Lab ID L2767-41

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.334	U	
Total Dichlorobiphenyls	ND	pg/g	1.34	U	MB, RB-I
Total Trichlorobiphenyls	13.3	pg/g	0.397		
Total Tetrachlorobiphenyls	76	pg/g	0.199		
Total Pentachlorobiphenyls	443	pg/g	0.416		
Total Hexachlorobiphenyls	676	pg/g	0.42		
Total Heptachlorobiphenyls	216	pg/g	0.106		
Total Octachlorobiphenyls	118	pg/g	0.0964		
Total Nonachlorobiphenyls	67.8	pg/g	0.0994		
209 - Decachlorobiphenyl	12.8	pg/g	0.0454		
Total Polychlorinated Biphenyls	1620	pg/g			

SLC
10-8-01

Sample Results

Sample FS-16-WG-R

Fish: White Grunt

Lab ID L2767-41

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.702	U	
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.948	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	5.25	pg/g	0.213	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	8.67	pg/g	0.0953	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.26	pg/g	0.0779	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	11.2	pg/g	0.0862		
66 - 2,3',4,4'-Tetrachlorobiphenyl	13.6	pg/g	0.172		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.946	pg/g	0.198		
87 - 2,2',3,4,5-Pentachlorobiphenyl	25.7	pg/g	0.119	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	49	pg/g	0.103	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	47.7	pg/g	0.374		
118 - 2,3',4,4',5-Pentachlorobiphenyl	142	pg/g	0.363		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.636	pg/g	0.351		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	31.3	pg/g	0.319	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	198	pg/g	0.31	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	289	pg/g	0.272	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	19.2	pg/g	0.212		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.211	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	23.9	pg/g	0.071	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	74.3	pg/g	0.0642	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	24.5	pg/g	0.0926	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.516	pg/g	0.0663		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	55.9	pg/g	0.0659		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	3.74	pg/g	0.0559		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42.5	pg/g	0.0893		
209 - Decachlorobiphenyl	12.8	pg/g	0.0454		

SLC
10-8-01

Sample Results

Sample FS-17-WG-R

Fish: White Grunt

Lab ID L2767-42

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.323	pg/g	0.181		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	20.7	pg/g	0.224		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.28	pg/g	0.227		
118 - 2,3',4,4',5-Pentachlorobiphenyl	60.8	pg/g	0.228		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	0.775	U	ID(IR)-I
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.325	U	ID(IR)-I
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	7.44	pg/g	0.157		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	2.34	pg/g	0.144		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	4.04	pg/g	0.239		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.222	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	10.7	pg/g	0.0894	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	29.6	pg/g	0.0808	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ND	pg/g	0.659	U	ID(IR)-I

SLC
10-8-01

Sample Results

Sample FS-17-WG-R

Fish: White Grunt

Lab ID L2767-42

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.467	U	MB-I
Total Dichlorobiphenyls	ND	pg/g	1.54	U	MB, RB-I
Total Trichlorobiphenyls	8.38	pg/g	0.361		
Total Tetrachlorobiphenyls	32.9	pg/g	0.181		
Total Pentachlorobiphenyls	188	pg/g	0.252		
Total Hexachlorobiphenyls	279	pg/g	0.435		
Total Heptachlorobiphenyls	77.5	pg/g	0.133		
Total Octachlorobiphenyls	37.1	pg/g	0.125		
Total Nonachlorobiphenyls	19.2	pg/g	0.131		
209 - Decachlorobiphenyl	6	pg/g	0.0625		
Total Polychlorinated Biphenyls	650	pg/g			

SLC
10-8-01

Sample Results

Sample FS-17-WG-R Fish: White Grunt

Lab ID L2767-42 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.71	U	MB, RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.924	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.68	pg/g	0.152	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	4.99	pg/g	0.0799	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.57	pg/g	0.0653	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	5.46	pg/g	0.0723		
66 - 2,3',4,4'-Tetrachlorobiphenyl	5.89	pg/g	0.141		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.323	pg/g	0.181		
87 - 2,2',3,4,5-Pentachlorobiphenyl	8.88	pg/g	0.134	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	21.5	pg/g	0.115	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	20.7	pg/g	0.224		
118 - 2,3',4,4',5-Pentachlorobiphenyl	60.8	pg/g	0.228		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.325	U	ID(IR)-I
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	14	pg/g	0.33	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	80.3	pg/g	0.321	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	123	pg/g	0.281	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	7.44	pg/g	0.157		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.222	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	10.7	pg/g	0.0894	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	29.6	pg/g	0.0808	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	8.98	pg/g	0.117	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.182	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	15.5	pg/g	0.083		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1.7	pg/g	0.0856		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	11.4	pg/g	0.127		
209 - Decachlorobiphenyl	6	pg/g	0.0625		

SLC
10-8-01

Sample Results

Sample FS-18-WG-R

Fish: White Grunt

Lab ID L2767-43

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.499	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	19	pg/g	0.286		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.09	pg/g	0.28		
118 - 2,3',4,4',5-Pentachlorobiphenyl	61.4	pg/g	0.283		
123 - 2',3,4,4',5-Pentachlorobiphenyl	0.567	pg/g	0.331		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.271	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	5.87	pg/g	0.167		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	ND	pg/g	2.28	U	ID(IR)-I
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	3.77	pg/g	0.159		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.139	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	9.9	pg/g	0.0804	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	23.3	pg/g	0.0727	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	0.604	pg/g	0.0481		

SLC
10-8-01

Sample Results

Sample FS-18-WG-R

Fish: White Grunt

Lab ID L2767-43

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.263	U	
Total Dichlorobiphenyls	ND	pg/g	0.831	U	MB, RB-I
Total Trichlorobiphenyls	5.95	pg/g	0.294		
Total Tetrachlorobiphenyls	27.4	pg/g	0.125		
Total Pentachlorobiphenyls	163	pg/g	0.331		
Total Hexachlorobiphenyls	253	pg/g	0.282		
Total Heptachlorobiphenyls	62.4	pg/g	0.12		
Total Octachlorobiphenyls	28.2	pg/g	0.0764		
Total Nonachlorobiphenyls	19.1	pg/g	0.0722		
209 - Decachlorobiphenyl	5.16	pg/g	0.0399		
Total Polychlorinated Biphenyls	565	pg/g			

SLC
10-8-07

Sample Results

Sample FS-18-WG-R Fish: White Grunt

Lab ID L2767-43 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.595	U	ID(IR),MB,RB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.697	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.39	pg/g	0.176	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	4.67	pg/g	0.0991	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	1.96	pg/g	0.0809	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	4.4	pg/g	0.0895		
66 - 2,3',4,4'-Tetrachlorobiphenyl	4.96	pg/g	0.103		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.499	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	6.85	pg/g	0.119	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	15	pg/g	0.102	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	19	pg/g	0.286		
118 - 2,3',4,4',5-Pentachlorobiphenyl	61.4	pg/g	0.283		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.271	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	13	pg/g	0.214	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	75	pg/g	0.208	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	118	pg/g	0.182	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	5.87	pg/g	0.167		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.139	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	9.9	pg/g	0.0804	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	23.3	pg/g	0.0727	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	7.51	pg/g	0.105	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.101	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	15	pg/g	0.0747		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1.1	pg/g	0.0584		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	12.5	pg/g	0.0663		
209 - Decachlorobiphenyl	5.16	pg/g	0.0399		

SLC
10-8-01

Sample Results

Sample FS-19-WG-R

Fish: White Grunt

Lab ID L2767-44

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.743	pg/g	0.314		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	48.8	pg/g	0.544		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.65	pg/g	0.53		
118 - 2,3',4,4',5-Pentachlorobiphenyl	162	pg/g	0.498		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.39	pg/g	0.567		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.605	pg/g	0.497		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	22.6	pg/g	0.24		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	6.26	pg/g	0.221		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	12.8	pg/g	0.106		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0951	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	38.2	pg/g	0.0414	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	118	pg/g	0.0374	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.5	pg/g	0.0457		

SLC
10-8-01

Sample Results

Sample FS-19-WG-R

Fish: White Grunt

Lab ID L2767-44

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.156	U	
Total Dichlorobiphenyls	ND	pg/g	1.88	U	MB, RB-I
Total Trichlorobiphenyls	13.7	pg/g	0.175		
Total Tetrachlorobiphenyls	59.9	pg/g	0.314		
Total Pentachlorobiphenyls	476	pg/g	0.578		
Total Hexachlorobiphenyls	879	pg/g	0.186		
Total Heptachlorobiphenyls	305	pg/g	0.0617		
Total Octachlorobiphenyls	165	pg/g	0.0515		
Total Nonachlorobiphenyls	114	pg/g	0.0554		
209 - Decachlorobiphenyl	23.1	pg/g	0.0295		
Total Polychlorinated Biphenyls	2040	pg/g			

SLC
10-8-01

Sample Results

Sample FS-19-WG-R Fish: White Grunt

Lab ID L2767-44 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.08	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	1.46	pg/g	0.132	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	4.22	pg/g	0.11	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	9.22	pg/g	0.056	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	ND	pg/g	4.3	U	ID(IR)-I
52 - 2,2',5,5'-Tetrachlorobiphenyl	7.18	pg/g	0.0506		
66 - 2,3',4,4'-Tetrachlorobiphenyl	14.1	pg/g	0.25		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.743	pg/g	0.314		
87 - 2,2',3,4,5-Pentachlorobiphenyl	17.2	pg/g	0.0491	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	51	pg/g	0.0422	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	48.8	pg/g	0.544		
118 - 2,3',4,4',5-Pentachlorobiphenyl	162	pg/g	0.498		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.605	pg/g	0.497		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	38.8	pg/g	0.141	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	245	pg/g	0.138	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	427	pg/g	0.121	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	22.6	pg/g	0.24		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0951	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	38.2	pg/g	0.0414	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	118	pg/g	0.0374	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	41.1	pg/g	0.054	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.704	pg/g	0.0387		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	62.2	pg/g	0.0385		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.56	pg/g	0.0515		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	77.9	pg/g	0.0502		
209 - Decachlorobiphenyl	23.1	pg/g	0.0295		

SLC 10-8-01

Sample Results

Sample FS-20-WG-R

Fish: White Grunt

Lab ID L2767-45

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.674	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	38.5	pg/g	0.399		
114 - 2,3,4,4',5-Pentachlorobiphenyl	ND	pg/g	2.36	U	ID(IR)-I
118 - 2,3',4,4',5-Pentachlorobiphenyl	112	pg/g	0.357		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.16	pg/g	0.377		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.514	pg/g	0.365		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	13.3	pg/g	0.181		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4.39	pg/g	0.167		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	7.86	pg/g	0.0365		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0313	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	18.3	pg/g	0.0488	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	49	pg/g	0.0441	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.07	pg/g	0.0246		

SLC
10-8-01

Sample Results

Sample FS-20-WG-R

Fish: White Grunt

Lab ID L2767-45

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.22	U	
Total Dichlorobiphenyls	ND	pg/g	1.9	U	MB, RB-I
Total Trichlorobiphenyls	11.7	pg/g	0.22		
Total Tetrachlorobiphenyls	49.9	pg/g	0.167		
Total Pentachlorobiphenyls	324	pg/g	0.419		
Total Hexachlorobiphenyls	480	pg/g	0.064		
Total Heptachlorobiphenyls	132	pg/g	0.0726		
Total Octachlorobiphenyls	52	pg/g	0.0564		
Total Nonachlorobiphenyls	36.7	pg/g	0.0546		
209 - Decachlorobiphenyl	9.47	pg/g	0.0332		
Total Polychlorinated Biphenyls	1100	pg/g			

SLC
10-8-01

Sample Results

Sample FS-20-WG-R

Fish: White Grunt

Lab ID L2767-45

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.04	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.932	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	4.32	pg/g	0.119	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	9.12	pg/g	0.0677	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	3.36	pg/g	0.0553	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	7.37	pg/g	0.0612		
66 - 2,3',4,4'-Tetrachlorobiphenyl	9.44	pg/g	0.131		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.674	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	13.3	pg/g	0.0581	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	32.7	pg/g	0.0499	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	38.5	pg/g	0.399		
118 - 2,3',4,4',5-Pentachlorobiphenyl	112	pg/g	0.357		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.514	pg/g	0.365		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	24.8	pg/g	0.0486	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	149	pg/g	0.0472	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	211	pg/g	0.0414	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	13.3	pg/g	0.181		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.0313	U	ID(NC)-I
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	18.3	pg/g	0.0488	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	49	pg/g	0.0441	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	14.5	pg/g	0.0636	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.242	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	33.9	pg/g	0.0453		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.11	pg/g	0.0399		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	24	pg/g	0.0522		
209 - Decachlorobiphenyl	9.47	pg/g	0.0332		

SLC
10-8-01

Sample Results

Sample FS-01-WG-T

Fish: White Grunt

Lab ID L2767-46

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	20.5	pg/g	1.27		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2460	pg/g	13.6		
114 - 2,3,4,4',5-Pentachlorobiphenyl	144	pg/g	14.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7620	pg/g	15		
123 - 2',3,4,4',5-Pentachlorobiphenyl	78.4	pg/g	16.6		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	15.6	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	856	pg/g	3.68		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	207	pg/g	3.36		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	362	pg/g	2.26		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.5	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	709	pg/g	0.16	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2390	pg/g	0.14	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	35.6	pg/g	0.43		

SLC 10-8-01

Sample Results

Sample FS-01-WG-T

Fish: White Grunt

Lab ID L2767-46

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.4	pg/g	0.198		
Total Dichlorobiphenyls	39.2	pg/g	0.696		
Total Trichlorobiphenyls	590	pg/g	0.434		
Total Tetrachlorobiphenyls	6120	pg/g	1.28		
Total Pentachlorobiphenyls	25700	pg/g	16.6		
Total Hexachlorobiphenyls	25300	pg/g	3.79		
Total Heptachlorobiphenyls	6660	pg/g	0.43		
Total Octachlorobiphenyls	4080	pg/g	0.833		
Total Nonachlorobiphenyls	1110	pg/g	0.216		
209 - Decachlorobiphenyl	57.8	pg/g	0.0907		
Total Polychlorinated Biphenyls	69700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-WG-T Fish: White Grunt

Lab ID L2767-46 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	11.1	pg/g	0.417		
18 - 2,2',5-Trichlorobiphenyl	34.5	pg/g	0.125	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	64.2	pg/g	0.313	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	476	pg/g	0.116	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	657	pg/g	0.0929	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	1380	pg/g	0.103		
66 - 2,3',4,4'-Tetrachlorobiphenyl	772	pg/g	1.09		
77 - 3,3',4,4'-Tetrachlorobiphenyl	20.5	pg/g	1.27		
87 - 2,2',3,4,5-Pentachlorobiphenyl	2150	pg/g	0.166	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	4470	pg/g	0.139	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2460	pg/g	13.6		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7620	pg/g	15		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	15.6	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1410	pg/g	3.02	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	7860	pg/g	2.89	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	8940	pg/g	2.5	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	856	pg/g	3.68		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.5	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	709	pg/g	0.16	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2390	pg/g	0.14	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	702	pg/g	0.172	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.73	pg/g	0.123		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1540	pg/g	0.121		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	176	pg/g	0.833		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	785	pg/g	0.216		
209 - Decachlorobiphenyl	57.8	pg/g	0.0907		

SLC
10-8-01

Sample Results

Sample FS-02-WG-T

Fish: White Grunt

Lab ID L2767-47

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	389	pg/g	16		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	46000	pg/g	706		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3050	pg/g	8.9		
118 - 2,3',4,4',5-Pentachlorobiphenyl	144000	pg/g	51.4		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1400	pg/g	9.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	65.4	pg/g	11.1		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	19100	pg/g	200		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	3660	pg/g	183		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	7750	pg/g	25.4		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	36.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	15000	pg/g	5.74	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	55800	pg/g	4.97	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	826	pg/g	2.81		

SLC
10-8-01

Sample Results

Sample FS-02-WG-T

Fish: White Grunt

Lab ID L2767-47

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	18	pg/g	0.308		
Total Dichlorobiphenyls	1050	pg/g	1.2		
Total Trichlorobiphenyls	14900	pg/g	4.14		
Total Tetrachlorobiphenyls	146000	pg/g	16		
Total Pentachlorobiphenyls	496000	pg/g	134		
Total Hexachlorobiphenyls	581000	pg/g	43.3		
Total Heptachlorobiphenyls	156000	pg/g	2.81		
Total Octachlorobiphenyls	61300	pg/g	10.4		
Total Nonachlorobiphenyls	10800	pg/g	0.631		
209 - Decachlorobiphenyl	424	pg/g	0.15		
Total Polychlorinated Biphenyls	1470000	pg/g			

SLC 10-8-01

Sample Results

Sample FS-02-WG-T Fish: White Grunt

Lab ID L2767-47 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	280	pg/g	0.754		
18 - 2,2',5-Trichlorobiphenyl	1580	pg/g	0.185	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	1460	pg/g	2.82	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	11900	pg/g	0.427	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	14400	pg/g	5.1	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	35000	pg/g	5.77		
66 - 2,3',4,4'-Tetrachlorobiphenyl	20400	pg/g	122		
77 - 3,3',4,4'-Tetrachlorobiphenyl	389	pg/g	16		
87 - 2,2',3,4,5-Pentachlorobiphenyl	40000	pg/g	10.4	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	88600	pg/g	8.9	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	46000	pg/g	706		
118 - 2,3',4,4',5-Pentachlorobiphenyl	144000	pg/g	51.4		
126 - 3,3',4,4',5-Pentachlorobiphenyl	65.4	pg/g	11.1		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	26200	pg/g	374	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	179000	pg/g	361	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	212000	pg/g	321	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	19100	pg/g	200		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	36.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	15000	pg/g	5.74	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	55800	pg/g	4.97	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	19600	pg/g	6.35	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	12.9	pg/g	0.785		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	31500	pg/g	4.52		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	3750	pg/g	10.4		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	7840	pg/g	0.627		
209 - Decachlorobiphenyl	424	pg/g	0.15		

SLC
10-8-01

Sample Results

Sample FS-03-WG-T

Fish: White Grunt

Lab ID L2767-48 i2

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	15	pg/g	3.02		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2150	pg/g	10.5		
114 - 2,3,4,4',5-Pentachlorobiphenyl	121	pg/g	9.43		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6100	pg/g	7.14		
123 - 2',3,4,4',5-Pentachlorobiphenyl	69.1	pg/g	10.2		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	12	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	903	pg/g	8.91		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	163	pg/g	8.14		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	308	pg/g	1.43		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.75	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	2370	pg/g	0.417	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10800	pg/g	0.363	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	81.1	pg/g	0.98		

SLC
10-8-01

Sample Results

Sample FS-03-WG-T

Fish: White Grunt

Lab ID L2767-48

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.96	pg/g	0.408		
Total Dichlorobiphenyls	38.8	pg/g	0.843		
Total Trichlorobiphenyls	523	pg/g	0.535		
Total Tetrachlorobiphenyls	4310	pg/g	3.02		
Total Pentachlorobiphenyls	20000	pg/g	12		
Total Hexachlorobiphenyls	38200	pg/g	2.51		
Total Heptachlorobiphenyls	27700	pg/g	0.98		
Total Octachlorobiphenyls	10600	pg/g	1.02		
Total Nonachlorobiphenyls	1530	pg/g	0.598		
209 - Decachlorobiphenyl	45	pg/g	0.351		
Total Polychlorinated Biphenyls	103000	pg/g			

SLC 10-8-01

Sample Results

Sample FS-03-WG-T Fish: White Grunt

Lab ID L2767-48 i2 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	8.61	pg/g	0.498		
18 - 2,2',5-Trichlorobiphenyl	38.1	pg/g	0.412	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	59	pg/g	0.261	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	348	pg/g	0.282	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	317	pg/g	0.225	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	917	pg/g	0.248		
66 - 2,3',4,4'-Tetrachlorobiphenyl	664	pg/g	2.38		
77 - 3,3',4,4'-Tetrachlorobiphenyl	15	pg/g	3.02		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1460	pg/g	0.427	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	3600	pg/g	0.361	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2150	pg/g	10.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6100	pg/g	7.14		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	12	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1430	pg/g	2	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	11000	pg/g	1.89	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	15700	pg/g	1.64	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	903	pg/g	8.91		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.75	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	2370	pg/g	0.417	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10800	pg/g	0.363	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	3190	pg/g	0.46	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.85	pg/g	0.313		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	5950	pg/g	0.318		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	662	pg/g	1.02		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1080	pg/g	0.598		
209 - Decachlorobiphenyl	45	pg/g	0.351		

SLC
10-8-01

Sample Results

Sample FS-04-WG-T

Fish: White Grunt

Lab ID L2767-49

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	19.2	pg/g	2.06		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2200	pg/g	13.8		
114 - 2,3,4,4',5-Pentachlorobiphenyl	145	pg/g	13.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7370	pg/g	13.2		
123 - 2',3,4,4',5-Pentachlorobiphenyl	69.8	pg/g	16		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	15.3	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	730	pg/g	4.96		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	166	pg/g	4.54		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	284	pg/g	1.92		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	509	pg/g	0.127	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2100	pg/g	0.111	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	26.6	pg/g	0.443		

SLC
10-8-01

Sample Results

Sample FS-04-WG-T

Fish: White Grunt

Lab ID L2767-49

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.54	pg/g	0.221		
Total Dichlorobiphenyls	52.6	pg/g	0.45		
Total Trichlorobiphenyls	2410	pg/g	1.6		
Total Tetrachlorobiphenyls	14800	pg/g	2.06		
Total Pentachlorobiphenyls	29900	pg/g	16		
Total Hexachlorobiphenyls	22400	pg/g	3.09		
Total Heptachlorobiphenyls	6510	pg/g	0.443		
Total Octachlorobiphenyls	3310	pg/g	0.691		
Total Nonachlorobiphenyls	753	pg/g	0.214		
209 - Decachlorobiphenyl	48.1	pg/g	0.0689		
Total Polychlorinated Biphenyls	80200	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-WG-T Fish: White Grunt

Lab ID L2767-49 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	17.1	pg/g	0.256		
18 - 2,2',5-Trichlorobiphenyl	49.2	pg/g	0.167	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	146	pg/g	1.15	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	1940	pg/g	0.198	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2790	pg/g	0.159	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	4290	pg/g	0.175		
66 - 2,3',4,4'-Tetrachlorobiphenyl	1130	pg/g	1.75		
77 - 3,3',4,4'-Tetrachlorobiphenyl	19.2	pg/g	2.06		
87 - 2,2',3,4,5-Pentachlorobiphenyl	2500	pg/g	0.37	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	5260	pg/g	0.311	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2200	pg/g	13.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7370	pg/g	13.2		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	15.3	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1030	pg/g	2.46	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5870	pg/g	2.36	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	7560	pg/g	2.03	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	730	pg/g	4.96		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	509	pg/g	0.127	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2100	pg/g	0.111	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	807	pg/g	0.137	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.25	pg/g	0.0979		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1690	pg/g	0.0969		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	175	pg/g	0.691		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	474	pg/g	0.214		
209 - Decachlorobiphenyl	48.1	pg/g	0.0689		

SLC
10-8-01

Sample Results

Sample FS-05-WG-T

Fish: White Grunt

Lab ID L2767-50

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	3.65	pg/g	0.816		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1160	pg/g	6.33		
114 - 2,3,4,4',5-Pentachlorobiphenyl	62.7	pg/g	6.53		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3070	pg/g	5.68		
123 - 2',3,4,4',5-Pentachlorobiphenyl	23.1	pg/g	6.99		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.72	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	316	pg/g	1.32		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	71.5	pg/g	1.21		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	112	pg/g	0.635		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.703	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	201	pg/g	0.101	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	483	pg/g	0.0884	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.84	pg/g	0.186		

SLC
10-8-01

Sample Results

Sample FS-05-WG-T

Fish: White Grunt

Lab ID L2767-50

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.566	U	RB-I
Total Dichlorobiphenyls	10	pg/g	0.347		
Total Trichlorobiphenyls	77.6	pg/g	0.223		
Total Tetrachlorobiphenyls	1460	pg/g	0.821		
Total Pentachlorobiphenyls	9630	pg/g	7.25		
Total Hexachlorobiphenyls	8210	pg/g	1.07		
Total Heptachlorobiphenyls	1430	pg/g	0.186		
Total Octachlorobiphenyls	416	pg/g	0.172		
Total Nonachlorobiphenyls	79.9	pg/g	0.113		
209 - Decachlorobiphenyl	6.62	pg/g	0.0656		
Total Polychlorinated Biphenyls	21300	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-WG-T Fish: White Grunt

Lab ID L2767-50 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.76	pg/g	0.226		
18 - 2,2',5-Trichlorobiphenyl	6.55	pg/g	0.122	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	19.7	pg/g	0.15	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	113	pg/g	0.147	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	93.5	pg/g	0.118	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	342	pg/g	0.13		
66 - 2,3',4,4'-Tetrachlorobiphenyl	210	pg/g	0.697		
77 - 3,3',4,4'-Tetrachlorobiphenyl	3.65	pg/g	0.816		
87 - 2,2',3,4,5-Pentachlorobiphenyl	745	pg/g	0.366	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1480	pg/g	0.307	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1160	pg/g	6.33		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3070	pg/g	5.68		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.72	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	537	pg/g	0.852	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2870	pg/g	0.816	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2380	pg/g	0.704	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	316	pg/g	1.32		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.703	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	201	pg/g	0.101	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	483	pg/g	0.0884	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	155	pg/g	0.109	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.775	pg/g	0.0777		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	271	pg/g	0.0769		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	23.1	pg/g	0.172		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	53.7	pg/g	0.113		
209 - Decachlorobiphenyl	6.62	pg/g	0.0656		

SLC 10-8-01

Sample Results

Sample FS-07-WG-T

Fish: White Grunt

Lab ID L2767-51 i

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.58	pg/g	1.24		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1590	pg/g	5.38		
114 - 2,3,4,4',5-Pentachlorobiphenyl	93.2	pg/g	5.52		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4690	pg/g	4.47		
123 - 2',3,4,4',5-Pentachlorobiphenyl	50.9	pg/g	5.69		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.88	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	539	pg/g	1.15		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	115	pg/g	1.05		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	211	pg/g	1.47		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.59	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	415	pg/g	0.358	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1240	pg/g	0.312	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	23.3	pg/g	0.393		

SLC
10-8-01

Sample Results

Sample FS-07-WG-T

Fish: White Grunt

Lab ID L2767-51

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.02	pg/g	0.432		
Total Dichlorobiphenyls	19.4	pg/g	0.461		
Total Trichlorobiphenyls	209	pg/g	0.446		
Total Tetrachlorobiphenyls	3290	pg/g	1.24		
Total Pentachlorobiphenyls	15500	pg/g	5.88		
Total Hexachlorobiphenyls	14900	pg/g	2.41		
Total Heptachlorobiphenyls	3520	pg/g	0.458		
Total Octachlorobiphenyls	1190	pg/g	0.627		
Total Nonachlorobiphenyls	230	pg/g	0.507		
209 - Decachlorobiphenyl	21.3	pg/g	0.333		
Total Polychlorinated Biphenyls	38900	pg/g			

SLC
10-8-01

Sample Results

Sample FS-07-WG-T Fish: White Grunt

Lab ID L2767-51 i Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	6.76	pg/g	0.284		
18 - 2,2',5-Trichlorobiphenyl	13.1	pg/g	0.344	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	52.3	pg/g	0.168	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	338	pg/g	0.263	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	270	pg/g	0.21	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	693	pg/g	0.232		
66 - 2,3',4,4'-Tetrachlorobiphenyl	501	pg/g	0.924		
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.58	pg/g	1.24		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1240	pg/g	0.348	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2350	pg/g	0.295	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1590	pg/g	5.38		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4690	pg/g	4.47		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.88	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	775	pg/g	1.92	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4670	pg/g	1.82	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	5120	pg/g	1.57	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	539	pg/g	1.15		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.59	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	415	pg/g	0.358	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1240	pg/g	0.312	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	434	pg/g	0.396	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.28	pg/g	0.269		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	672	pg/g	0.274		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	64.2	pg/g	0.627		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	153	pg/g	0.507		
209 - Decachlorobiphenyl	21.3	pg/g	0.333		

SLC
10-8-01

Sample Results

Sample FS-08-WG-T

Fish: White Grunt

Lab ID L2767-52

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.69	pg/g	0.874		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1920	pg/g	4.15		
114 - 2,3,4,4',5-Pentachlorobiphenyl	137	pg/g	4.25		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6800	pg/g	3.43		
123 - 2',3,4,4',5-Pentachlorobiphenyl	26.9	pg/g	4.81		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.66	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	588	pg/g	2.67		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	140	pg/g	2.44		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	214	pg/g	1.26		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.48	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	645	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2050	pg/g	0.114	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	23.6	pg/g	0.398		

SLC
10-8-01

Sample Results

Sample FS-08-WG-T

Fish: White Grunt

Lab ID L2767-52

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.483	pg/g	0.2		
Total Dichlorobiphenyls	15.7	pg/g	0.484		
Total Trichlorobiphenyls	169	pg/g	0.4		
Total Tetrachlorobiphenyls	2270	pg/g	0.874		
Total Pentachlorobiphenyls	16500	pg/g	4.81		
Total Hexachlorobiphenyls	19100	pg/g	2.16		
Total Heptachlorobiphenyls	4780	pg/g	0.398		
Total Octachlorobiphenyls	1540	pg/g	0.38		
Total Nonachlorobiphenyls	184	pg/g	0.173		
209 - Decachlorobiphenyl	12.3	pg/g	0.089		
Total Polychlorinated Biphenyls	44600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-WG-T Fish: White Grunt

Lab ID L2767-52 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.26	pg/g	0.321		
18 - 2,2',5-Trichlorobiphenyl	18.2	pg/g	0.156	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	22.3	pg/g	0.267	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	222	pg/g	0.155	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	177	pg/g	0.124	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	513	pg/g	0.137		
66 - 2,3',4,4'-Tetrachlorobiphenyl	310	pg/g	0.716		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.69	pg/g	0.874		
87 - 2,2',3,4,5-Pentachlorobiphenyl	771	pg/g	0.261	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1700	pg/g	0.22	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1920	pg/g	4.15		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6800	pg/g	3.43		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.66	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	963	pg/g	1.72	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5540	pg/g	1.65	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	8570	pg/g	1.42	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	588	pg/g	2.67		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.48	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	645	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2050	pg/g	0.114	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	586	pg/g	0.141	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.993	pg/g	0.1		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	668	pg/g	0.0992		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	115	pg/g	0.38		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	129	pg/g	0.173		
209 - Decachlorobiphenyl	12.3	pg/g	0.089		

SLC
10-8-01

Sample Results

Sample FS-09-WG-T

Fish: White Grunt

Lab ID L2767-53

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	68.8	pg/g	4.71		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	8480	pg/g	38.2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	534	pg/g	41		
118 - 2,3',4,4',5-Pentachlorobiphenyl	27600	pg/g	48.7		
123 - 2',3,4,4',5-Pentachlorobiphenyl	279	pg/g	43.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	19	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	4010	pg/g	16.3		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	722	pg/g	14.9		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	1380	pg/g	9.89		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	12.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	5800	pg/g	0.301	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	20400	pg/g	2.58	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	219	pg/g	1.41		

SLC
10-8-01

Sample Results

Sample FS-09-WG-T

Fish: White Grunt

Lab ID L2767-53

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.49	pg/g	0.201		
Total Dichlorobiphenyls	101	pg/g	0.452		
Total Trichlorobiphenyls	1590	pg/g	1.03		
Total Tetrachlorobiphenyls	23000	pg/g	4.71		
Total Pentachlorobiphenyls	95300	pg/g	51.9		
Total Hexachlorobiphenyls	121000	pg/g	16.3		
Total Heptachlorobiphenyls	56500	pg/g	1.41		
Total Octachlorobiphenyls	18300	pg/g	1.18		
Total Nonachlorobiphenyls	1350	pg/g	0.246		
209 - Decachlorobiphenyl	37.5	pg/g	0.12		
Total Polychlorinated Biphenyls	317000	pg/g			

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Sample Results

Sample FS-09-WG-T Fish: White Grunt

Lab ID L2767-53 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	16.2	pg/g	0.306		
18 - 2,2',5-Trichlorobiphenyl	191	pg/g	0.163	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	215	pg/g	0.681	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	2120	pg/g	0.115	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2170	pg/g	0.0922	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	5330	pg/g	0.102		
66 - 2,3',4,4'-Tetrachlorobiphenyl	3480	pg/g	3.64		
77 - 3,3',4,4'-Tetrachlorobiphenyl	68.8	pg/g	4.71		
87 - 2,2',3,4,5-Pentachlorobiphenyl	8010	pg/g	0.355	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	17700	pg/g	4.11	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	8480	pg/g	38.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	27600	pg/g	48.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	19	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	5160	pg/g	13	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	33500	pg/g	18.3	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	44400	pg/g	16	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	4010	pg/g	16.3		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	12.1	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	5800	pg/g	0.301	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	20400	pg/g	2.58	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	6520	pg/g	0.324	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.58	pg/g	0.231		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	11200	pg/g	2.24		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1260	pg/g	1.18		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	964	pg/g	0.246		
209 - Decachlorobiphenyl	37.5	pg/g	0.12		

SLC 10-8-01

Sample Results

Sample FS-10-WG-T

Fish: White Grunt

Lab ID L2767-54

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	149	pg/g	8.68		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	19600	pg/g	103		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1050	pg/g	85.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	48300	pg/g	64.2		
123 - 2',3,4,4',5-Pentachlorobiphenyl	637	pg/g	89		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	34	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	7720	pg/g	23.7		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1470	pg/g	21.7		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	2670	pg/g	13.9		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	18.8	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	6110	pg/g	0.399	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	32300	pg/g	2.25	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	313	pg/g	2.36		

SLC 10-8-01

Sample Results

Sample FS-10-WG-T

Fish: White Grunt

Lab ID L2767-54

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	3.77	pg/g	0.286		
Total Dichlorobiphenyls	308	pg/g	0.591		
Total Trichlorobiphenyls	3590	pg/g	2.68		
Total Tetrachlorobiphenyls	47200	pg/g	8.68		
Total Pentachlorobiphenyls	200000	pg/g	104		
Total Hexachlorobiphenyls	210000	pg/g	23.1		
Total Heptachlorobiphenyls	82600	pg/g	2.36		
Total Octachlorobiphenyls	62200	pg/g	5.93		
Total Nonachlorobiphenyls	12600	pg/g	0.98		
209 - Decachlorobiphenyl	343	pg/g	0.122		
Total Polychlorinated Biphenyls	619000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-10-WG-T Fish: White Grunt

Lab ID L2767-54 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	144	pg/g	0.396		
18 - 2,2',5-Trichlorobiphenyl	461	pg/g	0.218	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	500	pg/g	1.79	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	3220	pg/g	0.265	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5030	pg/g	0.213	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	10700	pg/g	0.235		
66 - 2,3',4,4'-Tetrachlorobiphenyl	6270	pg/g	6.75		
77 - 3,3',4,4'-Tetrachlorobiphenyl	149	pg/g	8.68		
87 - 2,2',3,4,5-Pentachlorobiphenyl	18600	pg/g	7.81	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	43600	pg/g	6.56	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	19600	pg/g	103		
118 - 2,3',4,4',5-Pentachlorobiphenyl	48300	pg/g	64.2		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	34	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	10200	pg/g	18.4	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	56800	pg/g	18.3	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	75900	pg/g	16	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	7720	pg/g	23.7		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	18.8	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	6110	pg/g	0.399	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	32300	pg/g	2.25	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	13000	pg/g	0.43	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	17.1	pg/g	0.307		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	17000	pg/g	1.95		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	2560	pg/g	5.93		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	9330	pg/g	0.95		
209 - Decachlorobiphenyl	343	pg/g	0.122		

SLC 10-8-01

Sample Results

Sample FS-11-WG-T Fish: White Grunt

Lab ID L2767-55 i2 Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	14.4	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1570	pg/g	7.15		
114 - 2,3,4,4',5-Pentachlorobiphenyl	85.1	pg/g	6.31		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4670	pg/g	5.16		
123 - 2',3,4,4',5-Pentachlorobiphenyl	52.9	pg/g	6.88		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.85	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	480	pg/g	1.32		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	103	pg/g	1.21		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	187	pg/g	3.91		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	5.06	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	313	pg/g	0.273	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	907	pg/g	0.238	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	19.1	pg/g	0.48		

SLC
10-8-01

Sample Results

Sample FS-11-WG-T

Fish: White Grunt

Lab ID L2767-55

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.4	pg/g	0.307		
Total Dichlorobiphenyls	36.9	pg/g	0.449		
Total Trichlorobiphenyls	637	pg/g	0.351		
Total Tetrachlorobiphenyls	4680	pg/g	3.29		
Total Pentachlorobiphenyls	16300	pg/g	7.15		
Total Hexachlorobiphenyls	12900	pg/g	7.02		
Total Heptachlorobiphenyls	2510	pg/g	0.48		
Total Octachlorobiphenyls	912	pg/g	0.451		
Total Nonachlorobiphenyls	176	pg/g	0.399		
209 - Decachlorobiphenyl	15.9	pg/g	0.363		
Total Polychlorinated Biphenyls	38200	pg/g			

SLC
10-8-01

Sample Results

Sample FS-11-WG-T Fish: White Grunt

Lab ID L2767-55 i2 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	8.1	pg/g	0.255		
18 - 2,2',5-Trichlorobiphenyl	58.1	pg/g	0.264	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	65.6	pg/g	0.221	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	385	pg/g	0.334	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	474	pg/g	0.267	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	1310	pg/g	0.294		
66 - 2,3',4,4'-Tetrachlorobiphenyl	597	pg/g	2.44		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	14.4	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	1230	pg/g	0.325	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2950	pg/g	0.275	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1570	pg/g	7.15		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4670	pg/g	5.16		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.85	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	677	pg/g	5.59	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4050	pg/g	5.3	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	4610	pg/g	4.58	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	480	pg/g	1.32		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	5.06	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	313	pg/g	0.273	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	907	pg/g	0.238	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	290	pg/g	0.302	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.33	pg/g	0.205		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	450	pg/g	0.208		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	53.1	pg/g	0.451		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	120	pg/g	0.399		
209 - Decachlorobiphenyl	15.9	pg/g	0.363		

SLC 10-8-01

Sample Results

Sample FS-14-WG-T

Fish: White Grunt

Lab ID L2767-56

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.94	pg/g	1.32		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1230	pg/g	8.82		
114 - 2,3,4,4',5-Pentachlorobiphenyl	69.9	pg/g	8.67		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3350	pg/g	7.31		
123 - 2',3,4,4',5-Pentachlorobiphenyl	32.2	pg/g	8.88		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	9.92	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	505	pg/g	3.95		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	106	pg/g	3.61		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	184	pg/g	3.78		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.89	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1000	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	5450	pg/g	0.113	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	32.1	pg/g	0.704		

SLC
10-8-01

Sample Results

Sample FS-14-WG-T

Fish: White Grunt

Lab ID L2767-56

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.353	pg/g	0.154		
Total Dichlorobiphenyls	8.59	pg/g	0.39		
Total Trichlorobiphenyls	89	pg/g	0.345		
Total Tetrachlorobiphenyls	1410	pg/g	1.32		
Total Pentachlorobiphenyls	10000	pg/g	9.92		
Total Hexachlorobiphenyls	22400	pg/g	6.3		
Total Heptachlorobiphenyls	14600	pg/g	0.704		
Total Octachlorobiphenyls	5850	pg/g	0.706		
Total Nonachlorobiphenyls	737	pg/g	0.271		
209 - Decachlorobiphenyl	36	pg/g	0.0805		
Total Polychlorinated Biphenyls	55100	pg/g			

SLC
10-8-01

Sample Results

Sample FS-14-WG-T

Fish: White Grunt

Lab ID L2767-56

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	2.57	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	6.27	pg/g	0.174	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	26.3	pg/g	0.223	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	109	pg/g	0.187	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	83.7	pg/g	0.15	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	281	pg/g	0.166		
66 - 2,3',4,4'-Tetrachlorobiphenyl	256	pg/g	1.05		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.94	pg/g	1.32		
87 - 2,2',3,4,5-Pentachlorobiphenyl	655	pg/g	0.313	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1490	pg/g	0.263	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1230	pg/g	8.82		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3350	pg/g	7.31		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	9.92	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	887	pg/g	5.02	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5920	pg/g	4.81	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	9710	pg/g	4.15	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	505	pg/g	3.95		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.89	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1000	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	5450	pg/g	0.113	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	1590	pg/g	0.14	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	1.11	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	3840	pg/g	0.0986		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	334	pg/g	0.706		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	513	pg/g	0.271		
209 - Decachlorobiphenyl	36	pg/g	0.0805		

SLC 10-8-01

Sample Results

Sample FS-15-WG-T

Fish: White Grunt

Lab ID L2767-57

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	159	pg/g	7.23		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	21900	pg/g	114		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1110	pg/g	87.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	51900	pg/g	76.7		
123 - 2',3,4,4',5-Pentachlorobiphenyl	648	pg/g	91.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	40.6	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	10700	pg/g	28.3		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1960	pg/g	25.8		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	3660	pg/g	21.6		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	28.3	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	6950	pg/g	0.537	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	16600	pg/g	3.08	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	388	pg/g	1.31		

SLC
10-8-01

Sample Results

Sample FS-15-WG-T

Fish: White Grunt

Lab ID L2767-57

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	3.74	pg/g	0.214		
Total Dichlorobiphenyls	242	pg/g	0.664		
Total Trichlorobiphenyls	3060	pg/g	1.75		
Total Tetrachlorobiphenyls	37900	pg/g	7.23		
Total Pentachlorobiphenyls	203000	pg/g	99.2		
Total Hexachlorobiphenyls	251000	pg/g	35.5		
Total Heptachlorobiphenyls	51000	pg/g	1.31		
Total Octachlorobiphenyls	14800	pg/g	1.96		
Total Nonachlorobiphenyls	2400	pg/g	0.281		
209 - Decachlorobiphenyl	86.6	pg/g	0.143		
Total Polychlorinated Biphenyls	563000	pg/g			

See
10-8-01

Sample Results

Sample FS-15-WG-T Fish: White Grunt

Lab ID L2767-57 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	107	pg/g	0.44		
18 - 2,2',5-Trichlorobiphenyl	308	pg/g	0.163	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	367	pg/g	1.18	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	3020	pg/g	0.296	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	4050	pg/g	0.238	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	8490	pg/g	0.263		
66 - 2,3',4,4'-Tetrachlorobiphenyl	5060	pg/g	5.64		
77 - 3,3',4,4'-Tetrachlorobiphenyl	159	pg/g	7.23		
87 - 2,2',3,4,5-Pentachlorobiphenyl	19500	pg/g	4.24	J	EMPC(C)-H
101 - 2;2',4,5,5'-Pentachlorobiphenyl	38000	pg/g	3.56	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	21900	pg/g	114		
118 - 2,3',4,4',5-Pentachlorobiphenyl	51900	pg/g	76.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	40.6	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	14100	pg/g	28.3	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	82100	pg/g	35.4	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	76000	pg/g	31	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	10700	pg/g	28.3		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	28.3	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	6950	pg/g	0.537	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	16600	pg/g	3.08	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	6360	pg/g	0.579	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	7.99	pg/g	0.413		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	8950	pg/g	0.409		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	881	pg/g	1.96		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1760	pg/g	0.281		
209 - Decachlorobiphenyl	86.6	pg/g	0.143		

SLC
10-8-01

Sample Results

Sample FS-16-WG-T

Fish: White Grunt

Lab ID L2767-58

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	59.9	pg/g	9.27		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	15300	pg/g	74.3		
114 - 2,3,4,4',5-Pentachlorobiphenyl	902	pg/g	66.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	35500	pg/g	53		
123 - 2',3,4,4',5-Pentachlorobiphenyl	446	pg/g	70.6		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	17.3	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6680	pg/g	22.9		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1310	pg/g	21		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	1880	pg/g	12		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	14.6	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	4370	pg/g	0.378	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10400	pg/g	2.5	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	191	pg/g	1.08		

SLC
10-8-01

Sample Results

Sample FS-16-WG-T

Fish: White Grunt

Lab ID L2767-58

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.54	pg/g	0.428		
Total Dichlorobiphenyls	75.6	pg/g	0.555		
Total Trichlorobiphenyls	1450	pg/g	1.86		
Total Tetrachlorobiphenyls	28800	pg/g	9.27		
Total Pentachlorobiphenyls	148000	pg/g	75.1		
Total Hexachlorobiphenyls	177000	pg/g	19.5		
Total Heptachlorobiphenyls	36800	pg/g	1.08		
Total Octachlorobiphenyls	9120	pg/g	1.13		
Total Nonachlorobiphenyls	884	pg/g	0.262		
209 - Decachlorobiphenyl	63.2	pg/g	0.122		
Total Polychlorinated Biphenyls	402000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-16-WG-T Fish: White Grunt

Lab ID L2767-58 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	26	pg/g	0.369		
18 - 2,2',5-Trichlorobiphenyl	75.1	pg/g	0.335	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	264	pg/g	1.18	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	2380	pg/g	0.258	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2320	pg/g	0.207	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	7790	pg/g	0.229		
66 - 2,3',4,4'-Tetrachlorobiphenyl	3470	pg/g	6.81		
77 - 3,3',4,4'-Tetrachlorobiphenyl	59.9	pg/g	9.27		
87 - 2,2',3,4,5-Pentachlorobiphenyl	16000	pg/g	3.88	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	23800	pg/g	3.26	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	15300	pg/g	74.3		
118 - 2,3',4,4',5-Pentachlorobiphenyl	35500	pg/g	53		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	17.3	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	11700	pg/g	15.6	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	60400	pg/g	14.5	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	48000	pg/g	12.7	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6680	pg/g	22.9		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	14.6	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	4370	pg/g	0.378	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10400	pg/g	2.5	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	2870	pg/g	0.407	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	5.14	pg/g	0.291		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	9320	pg/g	0.288		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	584	pg/g	1.13		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	577	pg/g	0.262		
209 - Decachlorobiphenyl	63.2	pg/g	0.122		

SLC
10-8-01

Sample Results

Sample FS-17-WG-T

Fish: White Grunt

Lab ID L2767-59

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	23.7	pg/g	4.84		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	8770	pg/g	35.8		
114 - 2,3,4,4',5-Pentachlorobiphenyl	602	pg/g	40.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	27400	pg/g	55.5		
123 - 2',3,4,4',5-Pentachlorobiphenyl	270	pg/g	43		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	16.2	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	3580	pg/g	1.8		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	711	pg/g	1.64		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	1340	pg/g	5.53		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	7.2	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	2340	pg/g	0.133	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	8180	pg/g	0.117	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	150	pg/g	1.1		

SLC
10-8-01

Sample Results

Sample FS-17-WG-T

Fish: White Grunt

Lab ID L2767-59

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.599	U	RB-I
Total Dichlorobiphenyls	14.8	pg/g	0.442		
Total Trichlorobiphenyls	277	pg/g	0.385		
Total Tetrachlorobiphenyls	9390	pg/g	4.84		
Total Pentachlorobiphenyls	61400	pg/g	49		
Total Hexachlorobiphenyls	70100	pg/g	9.13		
Total Heptachlorobiphenyls	16900	pg/g	1.1		
Total Octachlorobiphenyls	7000	pg/g	1.48		
Total Nonachlorobiphenyls	1680	pg/g	0.243		
209 - Decachlorobiphenyl	114	pg/g	0.104		
Total Polychlorinated Biphenyls	167000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-17-WG-T Fish: White Grunt

Lab ID L2767-59 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.73	pg/g	0.289		
18 - 2,2',5-Trichlorobiphenyl	8.59	pg/g	0.137	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	84	pg/g	0.244	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	372	pg/g	0.108	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	382	pg/g	0.0864	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	923	pg/g	0.0954		
66 - 2,3',4,4'-Tetrachlorobiphenyl	1980	pg/g	3.71		
77 - 3,3',4,4'-Tetrachlorobiphenyl	23.7	pg/g	4.84		
87 - 2,2',3,4,5-Pentachlorobiphenyl	2260	pg/g	0.458	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	5090	pg/g	0.385	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	8770	pg/g	35.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	27400	pg/g	55.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	16.2	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	3530	pg/g	7.28	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	22000	pg/g	8.28	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	29100	pg/g	7.25	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	3580	pg/g	1.8		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	7.2	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	2340	pg/g	0.133	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	8180	pg/g	0.117	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	2120	pg/g	0.144	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.36	pg/g	0.103		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2210	pg/g	0.102		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	407	pg/g	1.48		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1260	pg/g	0.243		
209 - Decachlorobiphenyl	114	pg/g	0.104		

SLC
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Sample Results

Sample FS-18-WG-T

Fish: White Grunt

Lab ID L2767-60

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	148	pg/g	7.15		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	50200	pg/g	586		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3880	pg/g	97.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	156000	pg/g	105		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1800	pg/g	102		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	71.8	U	
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	22800	pg/g	180		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4390	pg/g	164		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	7970	pg/g	54.5		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	89	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	12600	pg/g	0.821	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	27800	pg/g	5.92	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	768	pg/g	1.73		

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Sample Results

Sample FS-18-WG-T

Fish: White Grunt

Lab ID L2767-60

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	3.1	pg/g	0.261		
Total Dichlorobiphenyls	138	pg/g	0.59		
Total Trichlorobiphenyls	7900	pg/g	3.56		
Total Tetrachlorobiphenyls	163000	pg/g	7.57		
Total Pentachlorobiphenyls	538000	pg/g	128		
Total Hexachlorobiphenyls	566000	pg/g	91.5		
Total Heptachlorobiphenyls	81100	pg/g	1.73		
Total Octachlorobiphenyls	21600	pg/g	2.52		
Total Nonachlorobiphenyls	3040	pg/g	0.42		
209 - Decachlorobiphenyl	146	pg/g	0.116		
Total Polychlorinated Biphenyls	1380000	pg/g			

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Sample Results

Sample FS-18-WG-T

Fish: White Grunt

Lab ID L2767-60

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	47.1	pg/g	0.367		
18 - 2,2',5-Trichlorobiphenyl	123	pg/g	0.203	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	911	pg/g	2.43	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	12000	pg/g	0.333	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	17600	pg/g	5.38	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	41000	pg/g	6.09		
66 - 2,3',4,4'-Tetrachlorobiphenyl	22700	pg/g	96.7		
77 - 3,3',4,4'-Tetrachlorobiphenyl	148	pg/g	7.15		
87 - 2,2',3,4,5-Pentachlorobiphenyl	49200	pg/g	6.84	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	92200	pg/g	5.86	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	50200	pg/g	586		
118 - 2,3',4,4',5-Pentachlorobiphenyl	156000	pg/g	105		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	71.8	U	
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	24400	pg/g	79.7	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	169000	pg/g	76.8	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	203000	pg/g	68.3	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	22800	pg/g	180		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	89	U	
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	12600	pg/g	0.821	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	27800	pg/g	5.92	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	11100	pg/g	0.884	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	16.5	pg/g	0.631		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	12100	pg/g	5.38		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1250	pg/g	2.52		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	2120	pg/g	0.42		
209 - Decachlorobiphenyl	146	pg/g	0.116		

SLC
10-8-07

APPENDIX D-2

TO

A HUMAN HEALTH RISK ASSESSMENT FOR POTENTIAL EXPOSURE TO POLYCHLORINATED BIPHENYLS (PCBs) FROM SUNKEN VESSELS USED AS ARTIFICIAL REEFS (FOOD-CHAIN SCENARIO)

March 2004

SUPPLEMENTAL DATA VALIDATION REPORT

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1.0 INTRODUCTION

Inactive U.S. Navy vessels would make excellent artificial reefs in U.S. Coastal waters if preliminary data collected by the South Carolina Department of Natural Resources (SCDNR) and the Space and Naval Warfare Systems Center (SPAWAR), suggesting that they do not pose a threat to human health or the environment from polychlorinated biphenyl (PCB) contamination, can be confirmed. Such a study has been initiated by the Navy because it is known and documented that PCBs accumulate in fish tissue. For this study, three species of finfish samples were collected from a reference reef and a target reef. For the initial investigation, samples from two species were filleted and the fillets were sent to Axys Analytical Services, Ltd. in Sidney, British Columbia for analysis of PCBs in accordance with EPA Method 1668, Revision A. A copy of this method is included as Appendix A to Appendix D-1 above. After interpreting the data from the first round of analyses, a decision was made to analyze additional samples that were archived. The samples selected for the second round of analyses included samples from a third species as well as samples from two species analyzed in the initial round of analyses. The second round of analyses included 31 sea bass samples (20 from the reference reed and 11 from the target reef); 12 vermilion snapper samples (7 from the reference reef and 5 from the target reef); and 10 white grunt samples (5 from each reef).

Method 1668, Revision A utilizes a high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS) analytical technique which allows for congener-specific determination of more than 150 PCBs, including those that are considered to be dioxin-like and environmentally relevant. The dioxin-like PCBs and the beginning and ending level-of-chlorination PCBs are determined by the isotope dilution technique of quantitation whereas the other PCBs are determined by the internal standard method of quantitation. This method also allows estimation of homolog totals by level of chlorination (LOC) and estimation of total PCBs in a sample by summation of the concentrations of the PCB homolog group totals. For this study, 13 dioxin-like PCB congeners and 26 environmentally relevant PCB congeners (including 8 congeners that are also dioxin-like) were individually quantitated along with the total PCB concentration for each homolog group and the total PCB concentration.

The analytical results for the fish tissue samples were reported in one data package with Axys identification number 4025. The samples were prepared and analyzed in three preparation batches. This report describes the results of the data validation conducted on this data set. The data validation process is summarized in Section 2.0. Section 3.0 presents the data validation results. This report is concluded with an overall assessment of the data with respect to the data quality indicators of reporting limits, accuracy, precision, completeness, representativeness, and comparability in Section 4.0.

The sample reporting forms, printed from the database, are included in Appendix A.

2.0 DATA VALIDATION PROCESS

Per the Sampling and Analysis Quality Assurance Project Plan (SAQAPjP), all fish tissue sample data received an independent data validation to evaluate the quality of the data generated by the laboratory and the effect of having quality control indicators outside evaluation limits on the usability of the data. The data validation was conducted in accordance with the provisions of the SAQAPjP which specifies using guidance from the SAQAPjP, the written method, EPA Region 10 guidance on the validation of Method 1668 data for the HRGC/HRMS analysis, and guidance from Functional Guidelines (EPA 1999), as appropriate for the method. In accordance with the SAQAPjP, the validation consisted of evaluating laboratory performance parameters for at least 25% of the data set and sample-specific parameters for 100% of the data set.

Laboratory performance parameters are defined as those parameters that are in control of the analytical laboratory and thusly, are indicators of the overall performance of analytical system. The laboratory performance parameters evaluated include:

- GC/MS performance checks (i.e. tuning and resolution);
- initial calibration;
- calibration verification;
- system performance (i.e. ongoing precision and recovery as indicated through the analysis of laboratory control samples and certified reference materials);
- compound identification;
- compound quantitation; and
- verification (i.e. checking for transcription errors).

Sample-specific parameters are those parameters that are influenced by sample handling procedures and the matrix of the individual sample. The sample-specific parameters evaluated include:

- case narrative comments;
- sample handling (i.e. COC procedures, sample receipt, and holding times);
- method blank results;
- rinsate blank results;
- internal standard recovery;
- matrix spike analysis,
- laboratory duplicate sample analysis;
- field duplicate agreement.

Following the evaluation of laboratory performance criteria and sample-specific criteria, an overall assessment of the data with respect to the data quality indicators of sensitivity (reporting limits), accuracy, precision, completeness, representativeness, and comparability was formulated. The overall assessment is presented in Section 4.0.

During the data validation process, the data reviewer annotated on the analytical data sheets data validation qualifiers ("U", "J", "UJ", and "R") and associated qualifier and bias codes as listed in Table 2-1. The purpose of the qualifier codes is to provide information with regard to the data quality condition(s) that resulted in the assigned qualifiers. The bias code provides an indication of the bias direction of the results qualified as estimated based on data quality condition(s) that resulted in the data qualification and the results of the other associated quality control analyses. The data qualifier codes are followed by a hyphen and the applicable bias code. For example, a result qualified as estimated due to a holding time exceedance, which resulted in a potential low bias in the result, has the following code annotated on the data sheet, "HT-L". In the case of multiple data quality conditions resulting in qualification, each qualifier code is listed and separated by a comma. For example, a result qualified as estimated due to low matrix spike recovery and poor method duplicate precision would have the following codes annotated on the data sheet, "MS, MD – I". The analytical results with assigned data qualifiers, qualifier codes, and bias codes are included in Appendix A. The round 1 data validation report and analytical results are included in Appendix D-1.

Table 2-1
DATA VALIDATION QUALIFIER CODES AND BIAS DIRECTION CODES

Qualifier Code	Data Quality Condition Resulting In Assigned Qualification
General use	
HT	Holding time requirement was not met
T	Temperature requirement not met
P	Preservation requirements not met
HS	Sample received with headspace
MB or PB	Method blank or preparation blank contamination
LCS	Laboratory control sample evaluation criteria not met
FB	Field blank contamination
RB	Rinsate blank contamination
FD	Field duplicate evaluation criteria not met
RL	Reporting Limit exceeds decision criterion (for nondetects)
Organic methods	
R	Resolution criteria not met
TUNE	Instrument performance (tuning) criteria not met
ICAL	Initial calibration evaluation criteria not met
CCAL	Continuing calibration evaluation criteria not met
ID(IR) ID(NC)	Target compound identification criteria not met due to ion ratio (IR) or no confirmation (NC)
SUR	Surrogate recovery outside acceptance range
MS	Matrix spike accuracy criteria not met
MD	Method duplicate precision criteria not met
EMPC(C)	Estimated maximum possible concentration due to co-elution with one or more congeners
IS	Internal standard evaluation criteria not met
Bias Codes	**Bias Direction**
H	Bias in sample result likely to be high
L	Bias in sample result likely to be low
I	Bias in sample result is indeterminate

3.0 DATA REVIEW NARRATIVE

The results for the fish tissue samples were reported in Axys data package 4025. This is the sample package number as the initial set of data. Thus, the number 4025 is likely the laboratory's number assigned to the client and/or project. The results of the evaluation of laboratory performance criteria are presented in Section 3.1. The results of the evaluation of sample-specific criteria are presented in Section 3.2.

Table 3-1 lists the sample ID numbers, corresponding laboratory ID numbers, as well as fish type, reef type, and fillet date. For instances in which there are multiple laboratory IDs for the corresponding sample ID, results for the fish sample were reported from more than one analysis of the extract (e.g. multiple dilutions).

Table 3-1
SAMPLE IDENTIFICATION CROSS REFERENCE

New Field ID	Original Field ID	Lab ID	Fish	Reef	Sample Date
NEHC-0001	FS-07-WG-R	L3606-1	White Grunt	Reference	8/2/00
NEHC-0002	FS-19-SB-R	L3606-2	Black Sea Bass	Reference	5/4/00
NEHC-0002	FS-19-SB-R	L3606-2 i	Black Sea Bass	Reference	5/4/00
NEHC-0003	FS-20-SB-R	L3606-3	Black Sea Bass	Reference	5/4/00
NEHC-0004	FS-16-SB-R	L3606-4	Black Sea Bass	Reference	5/4/00
NEHC-0005	FS-08-SB-R	L3606-5	Black Sea Bass	Reference	5/4/00
NEHC-0006	FS-01-SB-T	L3606-6	Black Sea Bass	Target	5/4/00
NEHC-0007	FS-18-SB-R	L3606-7	Black Sea Bass	Reference	5/4/00
NEHC-0008	FS-10-VS-T	L3606-8	Vermilion Snapper	Target	8/1/00
NEHC-0009	FS-08-VS-R	L3606-9	Vermilion Snapper	Reference	8/1/00
NEHC-0009	FS-08-VS-R	L3606-9 i	Vermilion Snapper	Reference	8/1/00
NEHC-0010	FS-01-SB-R	L3606-10	Black Sea Bass	Reference	5/4/00
NEHC-0010	FS-01-SB-R	L3606-10 i	Black Sea Bass	Reference	5/4/00
NEHC-0011	FS-06-SB-R	L3606-11	Black Sea Bass	Reference	5/4/00
NEHC-0011	FS-06-SB-R	L3606-11 i	Black Sea Bass	Reference	5/4/00
NEHC-0012	FS-13-WG-T	L3606-12	White Grunt	Target	8/2/00
NEHC-0013	FS-06-SB-T	L3606-13	Black Sea Bass	Target	8/2/00
NEHC-0014	FS-19-WG-T	L3606-14	White Grunt	Target	8/2/00
NEHC-0015	FS-06-VS-R	L3606-15	Vermilion Snapper	Reference	8/1/00
NEHC-0016	FS-13-SB-R	L3606-16	Black Sea Bass	Reference	5/4/00
NEHC-0017	FS-11-SB-R	L3606-17	Black Sea Bass	Reference	5/4/00
NEHC-0018	FS-19-VS-R	L3606-18	Vermilion Snapper	Reference	8/1/00
NEHC-0019	FS-04-VS-R	L3606-19	Vermilion Snapper	Reference	8/1/00
NEHC-0020	FS-12-WG-T	L3606-20	White Grunt	Target	8/2/00
NEHC-0020	FS-12-WG-T	L3606-20 N	White Grunt	Target	8/2/00
NEHC-0020	FS-12-WG-T	L3606-20 W	White Grunt	Target	8/2/00
NEHC-0021	FS-08-SB-T	L3606-21	Black Sea Bass	Target	8/2/00
NEHC-0022	FS-07-SB-T	L3606-22	Black Sea Bass	Target	8/2/00
NEHC-0022	FS-07-SB-T	L3606-22 W	Black Sea Bass	Target	8/2/00
NEHC-0023	FS-09-SB-R	L3606-23R	Black Sea Bass	Reference	5/4/00
NEHC-0024	FS-14-SB-R	L3606-24	Black Sea Bass	Reference	5/4/00

New Field ID	Original Field ID	Lab ID	Fish	Reef	Sample Date
NEHC-0025	FS-04-WG-R	L3606-25R	White Grunt	Reference	8/2/00
NEHC-0026	FS-04-SB-R	L3606-26	Black Sea Bass	Reference	5/4/00
NEHC-0027	FS-02-SB-T	L3606-27	Black Sea Bass	Target	8/2/00
NEHC-0028	FS-11-WG-R	L3606-28R	White Grunt	Reference	8/2/00
NEHC-0029	FS-08-VS-T	L3606-29	Vermilion Snapper	Target	8/1/00
NEHC-0030	FS-12-VS-R	L3606-30	Vermilion Snapper	Reference	8/1/00
NEHC-0031	FS-09-SB-T	L3606-31	Black Sea Bass	Target	8/2/00
NEHC-0032	FS-20-WG-T	L3606-32	White Grunt	Target	8/2/00
NEHC-0032	FS-20-WG-T	L3606-32 W	White Grunt	Target	8/2/00
NEHC-0033	FS-05-SB-R	L3606-33R	Black Sea Bass	Reference	5/4/00
NEHC-0034	FS-12-SB-R	L3606-34	Black Sea Bass	Reference	5/4/00
NEHC-0035	FS-03-VS-R	L3606-35	Vermilion Snapper	Reference	8/1/00
NEHC-0036	FS-10-SB-T	L3606-36R	Black Sea Bass	Target	8/2/00
NEHC-0037	FS-19-VS-T	L3606-37R	Vermilion Snapper	Target	8/1/00
NEHC-0038	FS-05-VS-T	L3606-38R	Vermilion Snapper	Target	8/1/00
NEHC-0039	FS-05-WG-R	L3606-39R	White Grunt	Reference	8/2/00
NEHC-0040	FS-20-VS-R	L3606-40R	Vermilion Snapper	Reference	8/1/00
NEHC-0041	FS-02-SB-R	L3606-41R	Black Sea Bass	Reference	5/4/00
NEHC-0042	FS-17-SB-R	L3606-42R	Black Sea Bass	Reference	5/4/00
NEHC-0042	FS-17-SB-R	L3606-42R i	Black Sea Bass	Reference	5/4/00
NEHC-0043	FS-11-SB-T	L3606-43R	Black Sea Bass	Target	8/2/00
NEHC-0044	FS-07-SB-R	L3606-44R	Black Sea Bass	Reference	5/4/00
NEHC-0045	FS-06-WG-T	L3606-45R	White Grunt	Target	8/2/00
NEHC-0046	FS-10-SB-R	L3606-46R	Black Sea Bass	Reference	5/4/00
NEHC-0047	FS-04-SB-T	L3606-47R	Black Sea Bass	Target	8/2/00
NEHC-0048	FS-15-SB-R	L3606-48R	Black Sea Bass	Reference	5/4/00
NEHC-0048	FS-15-SB-R	L3606-48R i	Black Sea Bass	Reference	5/4/00
NEHC-0049	FS-03-SB-R	L3606-49R	Black Sea Bass	Reference	5/4/00
NEHC-0050	FS-03-SB-T	L3606-50R	Black Sea Bass	Target	8/2/00
NEHC-0051	FS-15-WG-R	L3606-51R	White Grunt	Reference	8/2/00
NEHC-0052	FS-14-VS-T	L3606-52R	Vermilion Snapper	Target	8/1/00
NEHC-0053	FS-05-SB-T	L3606-53R	Black Sea Bass	Target	8/2/00

3.1 Results of Laboratory Performance Criteria Evaluation

The results of the evaluation of laboratory performance criteria are described in this section. Evaluation of laboratory performance criteria allows the reviewer to assess the performance of the entire analytical system independent of sample matrix effects.

3.1.1 GC/MS Performance Check (Tuning and Resolution)

The GC/MS instrument checks specified in Section 10.0 of Method 1668, Revision A are performed to ensure mass resolution, identification, and calibration. These criteria include the following.

- For the perfluorokerosene (PFK) molecular leak, the resolution must be greater than or equal to 10,000. The deviation between the exact mass and the theoretical mass for each of the three to five ions monitored must be less than 5 parts per million (ppm).

- Each lock mass monitored shall not deviate by more that 20% throughout its respective retention time window.
- The ion abundance ratios must be within the limits specified in Table 8 of the method.
- The GC/MS system must be able to meet the minimum detection levels specified in Table 2 of the method. In addition, for the low point calibration standard, the signal to noise ratio (S/N) must be greater than or equal to 10.0.
- The absolute retention time of PCB169 shall exceed 20.0 minutes of the SPB-octyl column and the retention time of PCB157 shall exceed 25.0 minutes on the DB-1 column. In addition, the absolute retention time of PCB209 shall exceed 55 minutes on the SPB-octyl column.
- The compound pairs in the window defining mixture shall be determined.
- The isomer specificity requirements stated in Method 1668, Revision A (Section 6.9.1) shall be met. These specify that unique resolution, with a valley <40% of the smaller peak, will be obtained for the following congeners pairs: PCB34 and PCB23, PCB187 and PCB182, and PCB156 and PCB157 (secondary column).

The GC/MS performance criteria stated above were satisfied for both columns and data qualification was not necessary.

3.1.2 Initial Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for PCBs. Initial calibration demonstrates that the instrument is capable of producing a linear calibration curve.

As required by the method, each initial calibration contained five standards. Each initial calibration was conducted within 30 days of the associated sample analyses. For the native analytes quantitated by the isotope dilution method, the %RSDs over the relative response factors (RRFs) for the five initial standards was <20%. For the native analytes calculated by the internal standard method of quantitation, all %RSDs were <35%. The absolute retention time of PCB209 was greater than 55 minutes on the SPB-Octyl column. In addition, the signal to noise ratio (S/N) for all compounds was >10:1. Thus, all initial calibration criteria were met and data qualification was not necessary.

3.1.3 Calibration Verification

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument remains capable of producing acceptable qualitative and quantitative data each day that samples are analyzed.

For each calibration verification and ongoing precision and recovery (OPR) analysis, the following criteria were evaluated:

- Ion abundance ratios within acceptance ranges.

- S/N ratio ≥10:1.
- Adequate recovery of target analytes in calibration verification standard per requirements in Table 6 of the method.
- The absolute retention times of the labeled standards were within ±15 seconds of the preceding standard analysis.
- The relative retention times for native PCBs and labeled compounds in the verification test were within the required relative retention time (RRT) ranges.

Results for native and labeled PCB congeners in all calibration verification standard (SC3) analyses and in all Ongoing Precision and Recovery (OPR) analyses met the acceptance criteria specified in Section 15.3 of the method and data qualification was not required.

3.1.4 System Performance

System performance was evaluated by the results obtained for the routine analysis of a spiked control matrix (OPR analysis) and a certified reference material (CRM). Results for these analyses indicate whether the analytical system is in control. The subsections below describe the results for each evaluation parameter.

3.1.4.1 Ongoing Precision and Accuracy. As specified by the method, ongoing precision and recovery was monitored by preparing and analyzing a spiked control matrix sample with each preparation batch. The control matrix used was corn oil. These spiked samples are equivalent to laboratory control samples (LCS). The table below lists the OPR samples associated with each preparation batch.

OPR Sample
WG4619-102
WG4623-102
WG4884-102

The recoveries were compared to the acceptance ranges in Table 6 of Method 1668, Revision A (50-150% for natives, 30-140% for labeled standards, and 40-125% for clean-up standards). All recoveries were within the applicable acceptance range and data qualification was not necessary.

3.1.4.2 Analysis of Certified Reference Material (CRM). As indicated by the table below, an aliquot of a CRM was prepared with each preparation batch. The CRM provided was labeled as NIST CRM 1974a (organics in mussel tissue). The results are summarized in the Table 3-2.

CRM Sample
WG4619-105
WG4623-105
WG4884-105

Table 3-2
SUMMARY OF CRM RESULTS

PCB	Certified Value	Concentration found (pg/g)			Mean Conc. (pg/g)	Average Recovery	RSD (%)	Co-eluting Congeners	Ratio Measured Concentrations to Mean		
		WG4619	WG4623	WG4684					WG4619	WG4623	WG4684
44	8,280 +/- 840	**13,100**	**14,400**	**14,100**	**13,867**	**167%**	4.9%	47/65	0.945	1.038	1.017
49	10,120 +/- 590	**9,240**	9,970	9,680	9,630	95%	3.8%	69	0.960	1.035	1.005
52	13,100 +/- 1,300	12,900	**14,500**	**14,500**	13,967	107%	6.6%		0.924	1.038	1.038
66	11,540 +/- 500	**12,700**	**14,200**	**13,500**	**13,467**	117%	5.6%		0.943	1.054	1.002
101	14,600 +/- 1,100	**16,167**	**17,000**	**15,800**	**16,322**	112%	3.8%	90/113	0.990	1.042	0.968
105	6,040 +/- 390	5,480	5,910	5,400	5,597	93%	4.9%		0.979	1.056	0.965
118	14,900 +/- 400	**13,400**	14,600	**13,400**	**13,800**	93%	5.0%		0.971	1.058	0.971
128	2,500 +/- 390	**1,980**	2,330	**1,760**	**2,023**	81%	14.2%	166	0.979	1.152	0.870
138	15,200 +/- 1,100[1]	**17,600**	**16,600**	14,600	**16,267**	107%	9.4%	129/160/163	1.082	1.020	0.898
156	850 +/- 110	**1,040**	**1,200**	957	**1,066**	125%	11.6%	157	0.976	1.126	0.898
170	630 +/- 120	**236**	**270**	**230**	**245**	**39%**	8.8%		0.962	1.101	0.938
180	1,950 +/- 430	**1,470**	1,610	**1,420**	**1,500**	77%	6.6%	193	0.980	1.073	0.947
183	1,820 +/- 270	1,840	**2,130**	1,930	1,967	108%	7.5%	185	0.936	1.083	0.981
187	3,870 +/- 270	3,720	**4,230**	3,760	3,903	101%	7.3%		0.953	1.084	0.963
								Average Ratio	0.970	1.069	0.961
								Ratio RSD	3.9%	3.5%	5.0%

[1] Certified value for combination of PCB 138/163/164.

Table is limited to those PCBs that are project target analytes.

In general, the CRM results obtained mirror those obtained in association with the first round of analyses. While many results shown in Table 3-2 are not within the 95% level of confidence window of the certified value, most mean values (12/14) are within the acceptance range of 50-150%, which is the acceptance range specified in the method for evaluating OPR samples. The two exceptions are PCB44 and PCB170. For PCB44 and PCB170, the determined values are consistently higher and lower, respectively, than the certified values. Therefore, data qualification was limited to PCB44 and PCB170.

- PCB170 was reported as present in all samples. Thus, all PCB170 results were qualified as estimated (J) with a potential low bias.
- PCB 44 was initially reported as present in all samples; however, several results were qualified as nondetect (U) on the basis of the associated method blank results. Therefore, only positive PCB44 results were qualified as estimated (J) with a potential high bias.

The high recovery of PCB44 is likely related to the fact that this congener co-elutes with PCB47 and PCB65. While the average recovery of PCB170 is low at 39%, this result is consistent with the average recovery of 26% obtained for the first round of analyses. Overall, the CRM results are considered to indicate that the accuracy of the analyses, and thus the performance of the analytical system, is acceptable. This is further demonstrated by the ratio of individual results to the mean of the three results for each congener, also shown in Table 3-2.

The uniformity of the ratio within each analysis shown in Table 3-2 indicates that the differences between replicate CRM results are most likely due to sampling variability rather than imprecision in analysis. This would be consistent with the high water content of the samples, the relatively small sample size dictated by the PCB concentrations present, and sub-sampling difficulties encountered.

The CRM sample is prepared by NIST as a frozen homogenate in a free-flowing powder-like form which is required for the solid sub-sampling technique recommended in the NIST Certificate of Analysis. Notes on the sample receipt documentation indicate that the material in one of the three bottles was not free-flowing. As such, the integrity of this sample was considered to be compromised; this bottle of CRM sample material was not used by Axys.

3.1.5 Compound Identification

The following identification criteria had to be met for a PCB congener to be reported as present:

- The signals for the two exact m/z's listed in Table 7 must be present and must maximize within ±2 seconds of one another.
- The signal to noise ratio (S/N) of each of the two exact m/z's must be greater than or equal to 2.5 for a sample and greater than or equal to 10 for a calibration standard.
- The ratio of the integrated ion currents for the selected ion current profiles (SICPs) for both the exact m/z's monitored must be within the limits specified in Table 8 of the method.
- The relative retention time (RRT) of the peaks representing the unlabeled PCB congeners must be within 5% of the RRT obtained in the preceding standard analyses.

- The results for PCB156 and PCB157, which co-elute on the primary SPB-Octyl column, must be confirmed on a secondary column (DB-1).

With few exceptions, modifications to target compound identifications were not necessary. As a conservative measure, some target analytes were reported as detected although the ion ratio criterion was not satisfied. These results received a "R" flag from the laboratory. In most cases (22/23), the reported concentration was below the minimum reporting limit (MRL). Results for these analytes were qualified as nondetect (U) due to failure to meet the applicable ion ratio criterion. A qualifier code of ID(IR)-I was assigned to these results. For these results, the reported concentration is considered to be the "effective" reporting limit. The table below lists the affected samples.

Results Qualified as Nondetect due to Identification Criteria

Field Sample	Analyte	Field Sample	Analyte
FS-07-WG-R (NEHC-0001)	PCB184	FS-11-WG-R (NEHC-0028)	PCH184
FS-20-SB-R (NEHC-0003)	PCB184	FS-08-VS-T (NEHC-0029)	PCB77
FS-16-SB-R (NEHC-0004)	PCB18	FS-05-SB-R (NEHC-0033)	PCB184
FS-06-SB-R (NEHC-0011)	PCB18	FS-12-SB-R (NEHC-0034)	PCB18
FS-13-SB-R (NEHC-0016)	PCB18 PCB77	FS-06-WG-T (NEHC-0045)	PCB184
FS-11-SB-R (NEHC-0017)	PCB18 PCB184	FS-10-SB-R (NEHC-0046)	PCB8 PCB28 PCB123
FS-14-SB-R (NEHC-0024)	PCB184	FS-15-SB-R (NEHC-0048)	PCB123
FS-04-SB-R (NEHC-0026)	PCB77 PCB184	FS-05-SB-T (NEHC-0053)	PCB184

The PCB77 result for sample FS-12-WG-T (NEHC-0020) was initially reported with a "R" flag because the ion ratio reported for the primary column, 0.58, was outside the acceptance range of 0.65 to 0.89. However, the reviewer asked the laboratory to review the chromatography for this result because the associated concentration, 72.1 pg/g, was 24 times greater than the minimum reporting limit and 10 times greater than the detection limit. In addition, the secondary column indicated that PCB77 was present at 69 pg/g (ion ratio within the acceptance range). After the analyst reviewed the chromatography to ensure that the software integrated the ion peaks acceptably, the laboratory revised the PCB77 result for sample FS-12-WG-T. The revised result for PCB77 for sample FS-12-GS-T from the primary column is 82.2 pg/g with an associated ion ratio of 0.80. The laboratory provided an updated sample reporting form. The electronic data were updated manually.

As discussed below in Section 3.1.6, the PCB126 results for six samples were revised after investigating nondetect results with notably high detection limits. As a result of this evaluation, four nondetect PCB 126 results were revised to detections; PCB 126 detection limits were revised for the other two samples.

PCB156 and PCB157 were confirmed on the secondary column (DB-1). Because these two PCBs do not co-elute on the DB-1 column, all results for PCB156 and 157 were reported from the DB-1 column. In addition, all PCB169 results were confirmed by the secondary column.

3.1.6 Compound Quantitation

Target compound quantitation was evaluated by recalculating reported results to verify that calculations were performed using the proper values for all factors in the calculation. These factors include target analyte areas, reference internal standard area, internal standard concentration, sample weight, and relative response factor (RRF).

No errors in compound quantitation were found. However, several target PCB congeners co-elute with one or more non-target PCBs. Detected results for these PCBs were qualified as estimated (J) with a potential high bias because the reported value represents the sum of the concentrations of the target PCB in addition to other co-eluting congeners. A qualifier code of EMPC(C)-H was assigned to these results, where EMPC stands for estimated maximum possible concentration and the "C" in parentheses indicates co-elution as the cause. The affected PCBs are: PCB18, PCB28, PCB44, PCB49, PCB87, PCB101, PCB128, PCB138, PCB153, PCB180 and PCB183. Of these, the only dioxin-like congener is PCB180 that co-elutes with only one non-target PCB congener (PCB193). As such, risk calculations for the dioxin-like congeners should not be significantly affected by the potential high bias in PCB concentrations due to coelution.

The reviewer noted that PCB126 detection limits for six samples were several times greater than detection limits for other samples without a noticeable difference in the chromatographic response in the applicable region of the chromatogram. PCB126 is a dioxin-like congener. Because one-half of the detection limit is used in risk calculations for nondetect results, these apparently higher detection limits were of concern because they could potentially artificially raise risk calculations. Thus, Axys was contacted regarding the atypical PCB126 detection limits.

Axys explained that the detection limits are calculated by the instrument using a factor of 3 above the average noise detected in the region of the target analyte. Axys agreed that some of the PCB126 detection limits appeared to be unusually high. Thus, Axys reviewed PCB126 results for the six samples in question.

Based on the additional review, the PCB126 results for six samples were revised. Revised sample reporting forms were sent for the affected samples. The electronic data were corrected by hand. The affected samples include: FS-04SB-R (NEHC-0022), FS-02-SB-T (NEHC-0027), FS-09-SB-T (NEHC-0031), FS-05-VS-T (NEHC-0038), FS-11-SB-T (NEHC-0043), and FS-06-WG-T (NEHC-0045). For these six samples, the revised PCB126 results are those from the secondary column. In all cases, the PCB126 detection limits are lower. However, for the first four samples, the results from the secondary column indicated the presence of PCB126. In addition, Axys provided the associated QC information for PCB126 on the confirmation column and all evaluation criteria were satisfied.

PCB 126 results for 17 samples were qualified as estimated "J" with a qualifier code of EMPC(C)-H because the chromatogram for the primary column indicated that PCB 126 co-eluted with another component of the sample matrix. For these samples, the integrated areas used to calculate the PCB 126 results were considered to overestimate the amount of PCB 126

likely to be present. The affected samples include: FS-07-WG-R (NEHC-0001), FS-16-SB-R (NEHC-0004), FS-008-SB-R (NEHC-0005), FS-01-SB-T (NEHC-0006), FS-10-VS-T (NEHC-0008), FS-08-VS-R (NEHC-0009), FS-01-SB-R (NEHC-0010), FS-13-WG-T (NEHC-0012), FS-06-SB-T (NEHC-0013), FS-19-WG-T (NEHC-0014), FS-06-BS-R (NEHC-0015), FS-13-SB-R (NEHC-0016), FS-04-VS-R (NEHC-0019), FS-20-WG-T (NEHC-0032), FS-03-VS-R (NEHC-0035), FS-10-SB-T (NEHC-0036), and FS-10-SB-R (NEHC-0046).

3.1.7 Verification

The reviewer checked for correspondence between the raw sample data and the summary data provided. With the seven exceptions detailed above for which revised results were submitted, no transcription or reporting errors were found.

3.2 Results of Sample-Specific Review Criteria

The results of the evaluation of sample-specific criteria are described in this section. Evaluation of sample-specific criteria allows the reviewer to assess the how the individual sample matrices affect the performance of the method. In addition, the results obtained from field quality control samples are evaluated and related to the investigative field samples.

3.2.1 General Overall Assessment

All results are considered to be usable for meeting project objectives as qualified. Some results were qualified as nondetect based on method blank results or ion ratios. Some results were qualified as estimated due to CRM recoveries (as discussed above in Section 3.1.4.2) or co-elution with non-target congeners (as discussed above in Section 3.1.6)

3.2.2 Case Narrative Comments

The case narrative was very thorough, covering sample receipt and storage, sample preparation, analysis, reporting conventions, and QA/QC issues, including a summary and discussion of the CRM results.

- The case narrative noted that the samples were received in good condition on July 10 and 13, 2001. However, when received, the samples had thawed. The samples were kept frozen and in the dark until required for analysis.
- The tissue samples were homogenized and a representative subsample (approximately 15 grams) was taken for analysis. The data package includes sample homogenization, percent moisture, and percent lipid records. The percent moisture and percent lipid determinations were done in triplicate.
- The samples were analyzed in three batches, each containing a method blank, a laboratory generated spiked sample (LCS), a laboratory duplicate, a matrix spike sample (MS), and a client-supplied certified reference material (CRM).
- Chromatographic separation of PCB congeners was carried out on an SPB-Octyl chromatography column. Because PCB156 and PCB157 co-elute on this column, a second

column (DB-1) was used for resolution of these congeners. All results for PCB156 and PCB157 were reported from the DB-1 column.

- The case narrative provided an explanation of the Axys reporting conventions, including definitions of all laboratory qualifiers.
- The case narrative noted that all QC (linearities, calibration verifications, ongoing precision and recovery, blanks) criteria were met in association with the analysis of these samples.
- The PCB169 results were also reported from the confirmation DB-1 column due to potential interferences from higher homologue congeners in the quantification of this analyte on the Octyl column.
- Matrix spike results for some analytes were not reported because the native concentrations of the spiked congeners were greater than four times the spiking level rendering the spike results inappropriate for assessing accuracy.
- Samples FS-09-SB-R (NEHC-0023), FS-11-WG-T (NEHC-0028), and FS-05-SB-R (NEHC-0033) were reanalyzed because the original results were comparable to the results for the associated method blank results. The original results are considered to be preliminary and the results for the reanalysis were reported as the final data.
- A couple of samples were re-injected to evaluate whether the samples were affected by carry-over. Examination of results for the re-injected analyses indicated that the samples were not affected by carry-over so the original sample results were reported.
- During sample preparation, six proofs (i.e. equipment rinsate blanks) of the Virtis grinder were created. Two were randomly selected for analysis and the others were archived. The first, sample L3712-1, was created after homogenization of sample NEHC-0002, and the second, sample L3712-2, was created after homogenization of sample NeHC-0042. Some mono-, di-, and trichoro-substituted PCBs were detected in these proofs and the associated method blank, sample LAB BLANK WG4669-101.

Also included in the data package was a copy of all email correspondence pertaining to this project.

3.2.3 Sample Handling (COC Procedures, Sample Receipt, and Holding Times)

The fish samples were filleted on May 4, 2000 and August 1 and 2, 2000. After filleting, the samples were wrapped in foil and frozen. The fish fillet samples were shipped by Federal Express to Axys on July 9, 2001 under proper COC procedures. Custody seals were used and the shipping containers were intact upon receipt at Axys on July 10, 2001. Cooler temperatures upon receipt were 1°C to 3°C. Sample receiving notes indicated that the samples were received in good condition with ice present. The fish fillet samples were described as thawed. The samples were stored in the dark at <10°C until homogenization.

The CRM sample was sent to Axys by Arther D. Little, Inc. on July 11, 2001. The CRM sample was received by Axys on July 13, 2001. The sample receiving record indicated that the cooler temperature was <-20°C and that the dry ice was intact. The sample receiving records indicated that the material in bottle 1 of 3 was not a free-flowing powder. As such, notes on the log-in records indicate that either bottle 2 or 3 should be used to collect the sub-samples for analysis.

The log-in notes and batch lists also include a caution message to the analyst to be sure that the CRM sample does not thaw during sub-sampling and that the unused portion must be returned to the freezer "ASAP".

Sample homogenization occurred between July 12 and 27, 2001. Sample extraction occurred on July 28, July 30, and August 14, 2001. Sample analysis occurred between August 5, 2001 and August 24, 2001. Method 1668, Revision A does not specify holding time requirements, but does state that if stored in the dark at <10°C, tissue samples can be stored for up to one year. The SAQAPjP and EPA Region X guidance specify a holding time limit of 1 year for samples that have been stored in the dark at <10°C. Although this holding time was exceeded for all samples, data qualification on the basis of holding times was not considered necessary because the time between filleting the fish to extracting the samples was 13-15 months. This holding time could not have been avoided as these data are supplemental analyses deemed necessary to the interpretation of the data from the initial round of sample analyses. In addition, because the samples were stored in the dark at <10°C until homogenization, the integrity of the samples in not considered to have been adversely affected by a holding time greater than 1 year.

However, one difference in sample preparation was noted. The method specifies in Section 12.4 that prior to extraction, the tissue samples (typically a 10g aliquot) should be dried with 30 to 40g of anhydrous sodium sulfate for 12-24 hours. The fish tissue samples were dried for approximately 1 hour. However, Axys indicated that the drying time was sufficient to reach equilibrium as the amount of anhydrous sodium sulfate used ranged from 75-100g and the sample volume was approximately 15g. The laboratory modified the drying step in order to process samples more efficiently. They indicated that studies of the modified process showed that the ½ to 1 hour elapsed time was sufficient to dry the solvent. The objective of drying the solvent is to assure uniform and adequate extraction efficiency of the solvent. It is not used in percent moisture determination. The standard recoveries measured on samples verify that extraction efficiency has not been adversely affected. The shortened drying time is not considered to affect the overall quality or usability of the data.

3.2.4 Blank Results

Analyte results for samples were qualified as nondetect (U) if they were less than five times the amount found in the associated method blank or rinsate blank. The subsections below detail which sample results were qualified as nondetect on the basis of method blank or rinsate blank results. In these instances, the measured concentration becomes the effective sample reporting limit.

3.2.4.1 Method Blanks. The samples were prepared in three batches. As such, there were three method blanks (MBs) analyzed in association with the fish tissue samples. The table below summarizes the method blank detections and associated fish population contained in each of the four batches.

Summary of Analytes Detected in Method Blanks and Associated Samples

Analyte	WG4617-101 (NEHC-0001 through NEHC-0017)	WG4623-101 (NEHC-0018 through NEHC-0035)	WG4683-101 (NEHC-0036 through NEHC-0053)
PCB 8		0.566 R	
PCB 18	0.307 R	0.391	0.732 R
PCB 28	0.358	0.970	0.171 R
PCB 44	0.679	1.19	5.72
PCB 49		1.14	0.364 R
PCB 52	0.317 R	2.29	0.568
PCB 66	0.173 R	1.89	
PCB 77		0.163	
PCB 87		2.66	0.251
PCB 101	0.208	6.18	0.560
PCB 105		2.38	
PCB 114		0.155 R	
PCB 118	0.177 R	7.92	0.552 R
PCB 128		1.10	
PCB 138	0.123	6.57	0.797 R
PCB 153	0.194 R	6.72	0.568 R
PCB 156[1]		1.22	
PCB 167		0.380	
PCB 170		0.862 R	
PCB 180		1.23	
PCB 187	0.103	1.00 R	
PCB 189		0.077	
PCB 195		0.130 R	
PCB 206		0.160 R	
t MCBs		0.188	
t TriCBs	0.942	3.29	0.895
t TeCBs	0.679	10.5	8.41
t PeCBs	0.208	30.0	0.792
t HxCBs	0.123	22.0	
t HpCBs		1.46	
t OCBs		0.559	
t PCBs	1.95	68.0	10.1

All units are pg/g.
Only target analytes detected in one or more method blanks are included in this table.
R qualifier denotes that the ratio criterion was not met. Such values were treated as detections because the same interferences noted in the MBs are likely to be present in the samples as well.
[1] Results for confirmation column as all PCB156 results were reported from confirmation column.

The table below lists the sample results that were qualified as nondetect (U) based on the method blank results.

Summary of Results Qualified as Nondetect on the basis of Method Blank Results

Sample	PCB 8	PCB 18	PCB 28	PCB 44	PCB 49	PCB 52	PCB66	PCB 77	t MCBs	t TriCBs	t TetraCBs
FS-19-SB-R		U								U	
FS-20-SB-R		U									
FS-S6-SB-R		U								U	
FS-08-SB-R		U									
FS-18-SB-R		U									
FS-06-SB-R		U									
FS-13-SB-R		U									
FS-11-SB-R		U									
FS-04-VS-R									U		
FS-08-SB-T	U										
FS-09-SB-R	U			U							
FS-14-SB-R	U		U						U	U	
FS-04-WG-R	U	U									
FS-04-SB-R	U	U	U	U	U	U		U	U	U	U
FS-11-WG-R		U		U							
FS-05-SB-R		U		U							
FS-12-SB-R	U	U		U	U	U	U	U	U	U	U
FS-05-WG-R		U		U							
FS-20-VS-R		U		U							
FS-02-SB-R		U		U							
FS-17-SB-R		U		U							
FS-07-SB-R		U		U							
FS-10-SB-R		U		U						U	U
FS-15-SB-R		U		U						U	
FS-03-SB-R		U		U							
FS-15-WG-R		U		U							

U = Validation qualifier indicating that the result was qualified as nondetect. For such results, the reported value becomes the "effective" reporting limit.

The reviewer evaluated the potential effects of qualifying results as nondetect on the total PCB result for each sample. In all cases, the results qualified as nondetect on the basis of method blank contamination accounted for <1.8% of the associated total PCB results. As such, qualification as nondetect due to method blank contamination is not considered to affect the overall accuracy of the total PCB results.

3.2.4.2 Proofs (Rinsate Blanks). Six proof samples (similar to a rinsate blanks) were created by laboratory personnel by pouring "reagent-free" water through the decontaminated grinders used for sample homogenization. Two were randomly selected and analyzed. Sample L3712-1 is the proof created after sample FS-19-SB-R (NEHC-0002) was homogenized and sample L3712-2 is the proof created after sample FS-17-SB-R (NEHC-0042) was homogenized.

The table below summarizes the proof sample detections that remained after accounting for method blank contamination of the associated aqueous method blank.

Summary of Analytes Detected in Proofs

Analyte	L3712-1	L3712-2
PCB 49	5.81	
PCB 66	3.88	
PCB 153	6.89	

All units are pg/l.
Only target analytes detected in a proof sample are included in this table.

The rinsate blank concentrations (ug/l) were converted to equivalent fish tissue concentrations by assuming that all of the target analyte present in the rinsate blank aliquot analyzed was present in the fish tissue aliquot analyzed. This calculation resulted in the maximum possible contribution due to potential cross contamination. Sample results less than five times this maximum possible contribution due to potential cross contamination were qualified as nondetect (U) based on the rinsate blank results. The affected results include the PCB 49 results for samples FS-19-SB-R and FS-12-SB-R.

3.2.5 Standard Recovery

Standards are injected into the individual samples prior to extraction, prior to clean-up, and prior to injection to monitor the various stages of sample preparation and analysis. The results obtained for each type are discussed below.

3.2.5.1 Recovery of ^{13}C-Labeled Internal Standards. ^{13}C-Labeled PCB congeners are added to each sample and method blank prior to extraction in order to be an internal standard for the quantitation of native dioxin-like and environmentally relevant PCB isomers. These internal standards also serve for the assessment of the extraction efficiency for the individual sample matrices. The recoveries of the ^{13}C-labeled internal standards were compared to the recovery limits of 25-125% specified in Table 6 of the Method 1668, Revision A.

With one exception, the recoveries of all project-related internal standards were within the acceptance range of 25-125% for each sample and data qualification was not necessary. For sample FS-04-SB-R (NEHC-0026), the recoveries of PCB 1L and PCB 3L were 18.3% and 22.8%, respectively. The only target analyte quantitated using these internal standards is total monochlorbiphenyls (tMCBs). To reflect the low internal standard recovery, the tMCBs result for sample FS-04-SB-R (NEHC-0026) was qualified as estimated (J).

3.2.5.2 Recovery of Clean-up Standards. A solution containing three ^{13}C-labeled congeners is spiked into each sample and blank prior to clean-up to measure the efficiency of the clean-up

process. The recoveries of the clean-up standards were compared to the acceptance range of 30-135% specified in Table 6 of Method 1668, Revision A.

For each sample, the recoveries of all three clean-up standards were within the acceptance range of 30-135% and data qualification was not necessary.

3.2.5.3 Recovery of ^{13}C-Labeled Injection Internal Standards (Recovery Standards). A solution containing five ^{13}C-labeled PCBs congeners is spiked into each sample prior to injection (but after clean-up) for the following reasons:

- to determine the recovery efficiency of the combined extraction and clean-up procedures,
- to determine if the GC/MS sensitivity and response are stable during every analytical run, and
- to determine if the same amount of extract was injected into the GC/MS.

Injection internal standard performance was evaluated by comparing the total area for the two characteristic masses for each of the injection standards to a range of –25% to +200% of the average area sum for the five initial calibration standards.

The responses noted for the injection standards for each sample satisfied this evaluation criterion and data qualification was not necessary.

3.2.6 Matrix Spike/Matrix Spike Duplicate Results

As indicated in the table below, a matrix spike (MS) and matrix spike duplicate (MSD) sample were prepared from additional aliquots of three samples. The samples selected for MS/MSD analysis were dependent on available sample volume.

Summary of MS and MSD Samples

MS and MSD Samples	Parent Sample	Fish Population
WG4619-103 WG4619-104	FS-06-SB-T (NEHC-0013)	Sea Bass – Target Reef
WG4623-103 WG4623-104	FS-12-WG-T (NEHC-0020)	White Grunt – Target Reef
WG4684-103 WG4684-104	FS-02-SB-R (NEHC-0048)	Sea Bass – Reference Reef

The recoveries were compared against the SAQAPjP acceptance range of 50-150%. All recoveries for results with appropriate spike concentrations were within the acceptance range and data qualification was not necessary. However, it should be noted that for each sample, results for 1 to 10 of the 16 spike analytes were in appropriate for assessing accuracy because the native sample concentrations were greater than 4x the spiking concentration.

3.2.7 Spike Duplicate Analysis Results

Precision was evaluated from the results of the MS and MSD samples. The table in Section 3.2.6 presents the samples used for the MS/MSD analysis.

The SAQAPjP specified a precision objective of an RPD less than 50%. All RPDs were <25% with most being <10%. As such, the results for all spike duplicate samples (with appropriate spike concentrations) satisfied the evaluation criterion. Data qualification was not necessary and the laboratory spike duplicate results are considered to be indicative of acceptable overall analytical precision.

3.2.8 Field Duplicate Results

Field duplicate samples were not analyzed as part of this supplemental investigation. There were three sets of laboratory duplicate analyses designed to provide information on laboratory analysis precision. In addition, as part of the investigation, all 53 fish samples are already being split between two labs (Arthur D. Little analyses by modified Method 680 and AXYS analyses by Method 1668A). This provides field sampling and interlaboratory precision information. To prepare a field duplicate, an additional split of fish designed for the interlaboratory study would have to be performed. It was considered that adequate precision information can be ascertained from the 53 sets of interlaboratory split sample analyses and 3 sets of laboratory duplicate analyses.

4.0 OVERALL ASSESSMENT OF POLYCHLORINATED BIPHENYLS DATA

The fish tissue PCB results are considered to be usable for meeting project objectives with the qualifications noted in Section 3. Some results were qualified as nondetect (U) on the basis of method blank and/or rinsate blank contamination and some results were qualified as nondetect on the basis of identification criteria. In these instances, the reported value is then considered to be the "effective" reporting limit. In addition, a few sample results were qualified as estimated (J) on the basis of associated matrix spike recoveries, CRM results, or due to co-elution with one or more non-target PCBs.

The quantitative data quality indicators of sensitivity, accuracy, and precision are addressed below.

4.1 Sensitivity

For Method 1668, Revision A, analyte reporting limits are analyte-specific and sample-specific. For all target analytes, the laboratory calculated an estimated detection limit (EDL) based on a signal to noise ratio of 3:1.

In accordance with Section 3.2.4 of the SAQAPjP, an average target reporting limit <0.015 ng/g (15 pg/g) per individual congener was necessary in order to have a total PCB reporting limit of 3.2 ng/g which is necessary for risk-based evaluations. Of the 171 nondetect results for individual congeners (for which the average detection limit was 3 pg/g and the median detection limit was 1.29 pg/g), only 6 had detection limits greater than 15 pg/g. Of these six results, five were for PCB44 and one was for PCB66 results and all occurred for samples from various reference population. However, in each instance, the detection limits for the nondetect PCB44 and PCB66 results only accounted for 0.42% of the total PCB result. As such, the level of sensitivity achieved for the individual sample analyses is considered to be acceptable.

4.2 Accuracy

Accuracy is defined as the degree of agreement to an accepted reference or true value. Accuracy was measured as the percent recovery (%R) of an analyte in a reference standard (LCS or CRM) or spiked sample (MS).

All LCS recoveries were within acceptance limits. The mean recoveries for 12 of 14 CRM target analytes were within acceptance range of 50-150%. All of the 68 applicable matrix spike recoveries were within acceptance ranges. As such, the overall level of accuracy achieved for the analyses is considered to be acceptable.

4.3 Precision

Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true values (i.e. reproducibility). Precision of laboratory

measurements was evaluated by the comparison of spiked sample/spiked sample duplicate results.

The overall analytical precision of the analyses is considered to be acceptable as all spike duplicate measurements satisfied the applicable evaluation criterion.

4.4 Completeness

Completeness is defined as the percentage of data that is considered to be valid for meeting project objectives. Valid results include those qualified as estimated or nondetect.

All analytical results are considered to be valid and usable for meeting project objectives. As such, the analytical completeness for this data set is 100%.

4.5 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The DQO process was used in the development of the associated workplan, thereby optimizing the sample design. Representativeness was maintained during the sampling effort by completing sampling in compliance with the workplan and relevant SOPs.

Consistent, uniform sample handling protocols, including such tasks as storage, preservation, transportation, were used to assure that the representativeness of the samples gathered met project objectives. Proper documentation in the field and laboratory verified that protocols were followed and that sample identification as well as integrity was preserved.

In addition, in comparing results obtained for the supplemental investigation to the first investigation, it was noted that similar results were obtained for each sample population. As such, supplemental results suggest that the fish tissue samples are representative of the medium sampled.

4.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision because these quantities are measures of data reliability. Data are comparable if collection techniques, measurement procedures, analytical methods, and reporting limits are equivalent for the samples within a set. As the samples within this set were analyzed in accordance with the quality assurance and quality control measures prescribed by the analytical method and the SAQAPjP, and acceptable levels of overall accuracy and precision were obtained, the data within this set are considered to be comparable to each other.

APPENDIX A

SAMPLE REPORTING FORMS

The sample reporting forms presented in this appendix were generated from the database. They include all revised results or detection limits, validation qualifiers, qualifier codes, and bias codes assigned during validation. The forms have been generated such that there is one page summarizing the results for each "class" of PCBs for each sample (i.e. sample results for one sample are presented on 3 pages). The first page lists the results for the 13 PCBs that are considered to be dioxin-like. The second page lists the results for the homolog groups and the total PCBs. The third page lists the results for the PCBs that are considered to be environmentally relevant, including eight of the dioxin-like PCBs.

During the data validation process, the data reviewer annotated on the analytical data sheets data validation qualifiers ("U", "J", "UJ", and "R") and associated qualifier and bias codes as listed in Table A-1. The purpose of the qualifier codes is to provide information with regard to the data quality condition(s) that resulted in the assigned qualifiers. The bias code provides an indication of the bias direction of the results qualified as estimated based on data quality condition(s) that resulted in the data qualification and the results of the other associated quality control analyses. The data qualifier codes are followed by a hyphen and the applicable bias code. For example, a result qualified as estimated due to a holding time exceedance, which resulted in a potential low bias in the result, has the following code annotated on the data sheet, "HT-L". In the case of multiple data quality conditions resulting in qualification, each qualifier code is listed and separated by a comma. For example, a result qualified as estimated due to low matrix spike recovery and poor method duplicate precision would have the following codes annotated on the data sheet, "MS, MD – I". The analytical results with assigned data qualifiers, qualifier codes, and bias codes are included in this Appendix A.

These forms were generated from the database. They include all revised results or detection limits, validation qualifiers, qualifier codes, and bias codes assigned during validation. The forms have been generated such that there is one page summarizing the results for each "class" of PCBs for each sample (i.e. sample results for one sample are presented on 3 pages). The first page lists the results for the 13 PCBs that are considered to be dioxin-like. The second page lists the results for the homolog groups and the total PCBs. The third page lists the results for the PCBs that are considered to be environmentally relevant, including eight of the dioxin-like PCBs.

Table A-1
DATA VALIDATION QUALIFIER CODES AND BIAS DIRECTION CODES

Qualifier Code	Data Quality Condition Resulting In Assigned Qualification
general use	
HT	Holding time requirement was not met
T	Temperature requirement not met
P	Preservation requirements not met
HS	Sample received with headspace
MB or PB	Method blank or preparation blank contamination
LCS	Laboratory control sample evaluation criteria not met
FB	Field blank contamination
RB	Rinsate blank contamination
FD	Field duplicate evaluation criteria not met
RL	Reporting Limit exceeds decision criterion (for nondetects)
organic methods	
R	Resolution criteria not met
TUNE	Instrument performance (tuning) criteria not met
ICAL	Initial calibration evaluation criteria not met
CCAL	Continuing calibration evaluation criteria not met
ID	Target compound identification criteria not met due to ion ratio (IR) or no confirmation (NC)
SUR	Surrogate recovery outside acceptance range
MS	Matrix spike accuracy criteria not met
MD	Method duplicate precision criteria not met
EMPC(C)	Estimated maximum possible concentration due to co-elution with one or more congeners
IS	Internal standard evaluation criteria not met
Bias Codes	**Bias Direction**
H	Bias in sample result likely to be high
L	Bias in sample result likely to be low
I	Bias in sample result is indeterminate

Sample Results

Sample FS-01-SB-R

Fish: Black Sea Bass

Lab ID L3606-10 i

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.04	pg/g	0.914		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	417	pg/g	0.6		
114 - 2,3,4,4',5-Pentachlorobiphenyl	22.1	pg/g	0.6		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1400	pg/g	0.561		
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.64	pg/g	0.636		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.21	pg/g	0.705	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	372	pg/g	1		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	92.1	pg/g	1.04		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	131	pg/g	0.416		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.507		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1100	pg/g	0.114	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	3610	pg/g	0.0874	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	42.2	pg/g	0.437		

SLC
10-9-01

Sample Results

Sample FS-01-SB-R

Fish: Black Sea Bass

Lab ID L3606-10 i

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.992	pg/g	0.0674		
Total Dichlorobiphenyls	7.43	pg/g	0.14		
Total Trichlorobiphenyls	46.8	pg/g	0.0885		
Total Tetrachlorobiphenyls	422	pg/g	0.914		
Total Pentachlorobiphenyls	3470	pg/g	0.705		
Total Hexachlorobiphenyls	13900	pg/g	0.533		
Total Heptachlorobiphenyls	10400	pg/g	0.437		
Total Octachlorobiphenyls	3110	pg/g	0.578		
Total Nonachlorobiphenyls	957	pg/g	0.172		
209 - Decachlorobiphenyl	152	pg/g	0.0752		
Total Polychlorinated Biphenyls	32500	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-SB-R Fish: Black Sea Bass

Lab ID L3606-10 i Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.63	pg/g	0.105		
18 - 2,2',5-Trichlorobiphenyl	1.99	pg/g	0.0627	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	21.2	pg/g	0.0471	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	52.1	pg/g	0.0575	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	29	pg/g	0.0539	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	92.2	pg/g	0.0592		
66 - 2,3',4,4'-Tetrachlorobiphenyl	75.6	pg/g	0.769		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.04	pg/g	0.914		
87 - 2,2',3,4,5-Pentachlorobiphenyl	153	pg/g	0.0752	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	488	pg/g	0.0752	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	417	pg/g	0.6		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1400	pg/g	0.561		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.21	pg/g	0.705	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	325	pg/g	0.53	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2780	pg/g	0.53	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	7830	pg/g	0.53	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	372	pg/g	1		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.507		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1100	pg/g	0.114	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	3610	pg/g	0.0874	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	1040	pg/g	0.0948	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.52	pg/g	0.0647		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	3250	pg/g	0.0894		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	138	pg/g	0.578		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	637	pg/g	0.172		
209 - Decachlorobiphenyl	152	pg/g	0.0752		

SLC
10-8-01

Sample Results

Sample FS-02-SB-R

Fish: Black Sea Bass

Lab ID L3606-41R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.87	pg/g	0.81		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	156	pg/g	4.89		
114 - 2,3,4,4',5-Pentachlorobiphenyl	10.8	pg/g	4.79		
118 - 2,3',4,4',5-Pentachlorobiphenyl	446	pg/g	4.83		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.63	pg/g	4.84		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.38		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	76.5	pg/g	2.56		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	21.4	pg/g	2.41		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	32.1	pg/g	1.32		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.64		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	137	pg/g	0.429	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	371	pg/g	0.337	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.18	pg/g	0.379		

SLC
10-8-01

Sample Results

Sample FS-02-SB-R

Fish: Black Sea Bass

Lab ID L3606-41R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.33	pg/g	0.0895		
Total Dichlorobiphenyls	3.71	pg/g	0.269		
Total Trichlorobiphenyls	13.4	pg/g	0.139		
Total Tetrachlorobiphenyls	203	pg/g	0.81		
Total Pentachlorobiphenyls	1390	pg/g	6.38		
Total Hexachlorobiphenyls	2720	pg/g	2.16		
Total Heptachlorobiphenyls	1300	pg/g	0.43		
Total Octachlorobiphenyls	588	pg/g	0.381		
Total Nonachlorobiphenyls	223	pg/g	0.217		
209 - Decachlorobiphenyl	35.2	pg/g	0.154		
Total Polychlorinated Biphenyls	6480	pg/g			

SLC
10-8-01

Sample Results

Sample FS-02-SB-R

Fish: Black Sea Bass

Lab ID L3606-41R

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.64	pg/g	0.162		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.26	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	8	pg/g	0.0995	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	21.3	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	14.9	pg/g	0.0586	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	50.3	pg/g	0.0677		
66 - 2,3',4,4'-Tetrachlorobiphenyl	35.8	pg/g	0.655		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.87	pg/g	0.81		
87 - 2,2',3,4,5-Pentachlorobiphenyl	79.3	pg/g	0.226	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	224	pg/g	0.228	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	156	pg/g	4.89		
118 - 2,3',4,4',5-Pentachlorobiphenyl	446	pg/g	4.83		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.38		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	120	pg/g	1.69	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	745	pg/g	1.69	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1060	pg/g	1.45	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	76.5	pg/g	2.56		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.64		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	137	pg/g	0.429	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	371	pg/g	0.337	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	133	pg/g	0.377	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.01	pg/g	0.25		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	398	pg/g	0.345		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	16.5	pg/g	0.381		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	145	pg/g	0.217		
209 - Decachlorobiphenyl	35.2	pg/g	0.154		

SLC
10-8-01

Sample Results

Sample FS-03-SB-R

Fish: Black Sea Bass

Lab ID L3606-49R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.855		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	89.6	pg/g	1.21		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.63	pg/g	1.14		
118 - 2,3',4,4',5-Pentachlorobiphenyl	263	pg/g	1.08		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.66	pg/g	1.16		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.54		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	48.3	pg/g	1.44		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	16.8	pg/g	1.47		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	22.7	pg/g	1.36		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.78		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	137	pg/g	0.328	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	397	pg/g	0.255	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.81	pg/g	0.23		

SLC
10-8-01

Sample Results

Sample FS-03-SB-R

Fish: Black Sea Bass

Lab ID L3606-49R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.04	pg/g	0.205		
Total Dichlorobiphenyls	3.96	pg/g	0.405		
Total Trichlorobiphenyls	14.7	pg/g	0.416		
Total Tetrachlorobiphenyls	93.8	pg/g	0.855		
Total Pentachlorobiphenyls	659	pg/g	1.6		
Total Hexachlorobiphenyls	2200	pg/g	2.19		
Total Heptachlorobiphenyls	1550	pg/g	0.328		
Total Octachlorobiphenyls	900	pg/g	0.384		
Total Nonachlorobiphenyls	353	pg/g	0.261		
209 - Decachlorobiphenyl	59	pg/g	0.197		
Total Polychlorinated Biphenyls	5830	pg/g			

SLC
10-8-01

Sample Results

Sample FS-03-SB-R Fish: Black Sea Bass

Lab ID L3606-49R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.29	pg/g	0.266		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.4	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	5.57	pg/g	0.338	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	13	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.56	pg/g	0.291	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	20.2	pg/g	0.347		
66 - 2,3',4,4'-Tetrachlorobiphenyl	18.9	pg/g	0.74		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.855		
87 - 2,2',3,4,5-Pentachlorobiphenyl	24.6	pg/g	0.406	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	93	pg/g	0.411	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	89.6	pg/g	1.21		
118 - 2,3',4,4',5-Pentachlorobiphenyl	263	pg/g	1.08		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.54		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	75	pg/g	1.73	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	508	pg/g	1.74	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1050	pg/g	1.52	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	48.3	pg/g	1.44		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.78		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	137	pg/g	0.328	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	397	pg/g	0.255	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	138	pg/g	0.28	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.495	pg/g	0.19		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	558	pg/g	0.257		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	22.6	pg/g	0.384		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	215	pg/g	0.261		
209 - Decachlorobiphenyl	59	pg/g	0.197		

SLC
10-8-01

Sample Results

Sample FS-04-SB-R

Fish: Black Sea Bass

Lab ID L3606-26

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.312	U	ID(IR), MB-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	68.1	pg/g	1.26		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.83	pg/g	1.22		
118 - 2,3',4,4',5-Pentachlorobiphenyl	216	pg/g	1.18		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	1.24		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.51		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	49.3	pg/g	0.836		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	13.3	pg/g	0.775		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	17	pg/g	0.733		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.847		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	94.1	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	276	pg/g	0.0941	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.8	pg/g	0.0946		

SLC
10-8-01

Sample Results

Sample FS-04-SB-R

Fish: Black Sea Bass

Lab ID L3606-26

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.665	UJ	MB, IS-I
Total Dichlorobiphenyls	0.879	pg/g	0.759		
Total Trichlorobiphenyls	ND	pg/g	7.36	U	MB-I
Total Tetrachlorobiphenyls	ND	pg/g	44.8	U	MB-I
Total Pentachlorobiphenyls	474	pg/g	1.51		
Total Hexachlorobiphenyls	1600	pg/g	1.15		
Total Heptachlorobiphenyls	993	pg/g	0.121		
Total Octachlorobiphenyls	524	pg/g	0.133		
Total Nonachlorobiphenyls	258	pg/g	0.13		
209 - Decachlorobiphenyl	38.2	pg/g	0.0682		
Total Polychlorinated Biphenyls	3940	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-SB-R

Fish: Black Sea Bass

Lab ID L3606-26

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.879	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.976	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	ND	pg/g	2.47	U	MB-I
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	5.51	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	ND	pg/g	3.01	U	MB-I
52 - 2,2',5,5'-Tetrachlorobiphenyl	ND	pg/g	9.58	U	MB-I
66 - 2,3',4,4'-Tetrachlorobiphenyl	10.5	pg/g	0.264		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.312	U	ID(IR), MB-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	12.8	pg/g	0.136	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	64.7	pg/g	0.135	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	68.1	pg/g	1.26		
118 - 2,3',4,4',5-Pentachlorobiphenyl	216	pg/g	1.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.51		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	74.3	pg/g	0.941	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	377	pg/g	0.897	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	759	pg/g	0.801	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	49.3	pg/g	0.836		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.847		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	94.1	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	276	pg/g	0.0941	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	96.9	pg/g	0.103	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.117	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	321	pg/g	0.0979		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	14.9	pg/g	0.133		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	165	pg/g	0.13		
209 - Decachlorobiphenyl	38.2	pg/g	0.0682		

SLC
10-8-01

Sample Results

Sample FS-05-SB-R

Fish: Black Sea Bass

Lab ID L3606-33R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.48		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	71.9	pg/g	2.2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.31	pg/g	2.23		
118 - 2,3',4,4',5-Pentachlorobiphenyl	207	pg/g	2.09		
123 - 2',3,4,4',5-Pentachlorobiphenyl	3.66	pg/g	2.17		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.82		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	34	pg/g	2.14		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	10.3	pg/g	2.01		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	14.4	pg/g	0.718		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.89		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.2	pg/g	0.211	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	190	pg/g	0.166	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.93	pg/g	0.199		

SLC
10-8-01

Sample Results

Sample FS-05-SB-R

Fish: Black Sea Bass

Lab ID L3606-33R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.5	pg/g	0.114		
Total Dichlorobiphenyls	2.71	pg/g	0.325		
Total Trichlorobiphenyls	9.64	pg/g	0.0991		
Total Tetrachlorobiphenyls	89	pg/g	1.48		
Total Pentachlorobiphenyls	661	pg/g	2.82		
Total Hexachlorobiphenyls	1510	pg/g	1.17		
Total Heptachlorobiphenyls	775	pg/g	0.212		
Total Octachlorobiphenyls	361	pg/g	0.252		
Total Nonachlorobiphenyls	153	pg/g	0.226		
209 - Decachlorobiphenyl	43.1	pg/g	0.226		
Total Polychlorinated Biphenyls	3610	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-SB-R Fish: Black Sea Bass

Lab ID L3606-33R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.91	pg/g	0.205		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.1	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.55	pg/g	0.0702	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	12.8	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	7.2	pg/g	0.0461	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	17.1	pg/g	0.0532		
66 - 2,3',4,4'-Tetrachlorobiphenyl	23.2	pg/g	1.24		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.48		
87 - 2,2',3,4,5-Pentachlorobiphenyl	35.7	pg/g	0.123	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	105	pg/g	0.124	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	71.9	pg/g	2.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	207	pg/g	2.09		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.82		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	62.3	pg/g	0.915	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	434	pg/g	0.915	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	570	pg/g	0.781	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	34	pg/g	2.14		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.89		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.2	pg/g	0.211	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	190	pg/g	0.166	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	72.2	pg/g	0.186	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.417	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	261	pg/g	0.17		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	12.1	pg/g	0.252		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	94.2	pg/g	0.226		
209 - Decachlorobiphenyl	43.1	pg/g	0.226		

SLC
10-8-01

Sample Results

Sample FS-06-SB-R

Fish: Black Sea Bass

Lab ID L3606-11 i

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.924	pg/g	0.572		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	113	pg/g	1.08		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.55	pg/g	1.05		
118 - 2,3',4,4',5-Pentachlorobiphenyl	340	pg/g	0.999		
123 - 2',3,4,4',5-Pentachlorobiphenyl	3.91	pg/g	1.1		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.23		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	53.4	pg/g	0.553		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	14.7	pg/g	0.496		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	24.5	pg/g	0.654		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.756		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	130	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	333	pg/g	0.0923	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.5	pg/g	0.133		

SLC
10-8-01

Sample Results

Sample FS-06-SB-R

Fish: Black Sea Bass

Lab ID L3606-11 i

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.751	pg/g	0.111		
Total Dichlorobiphenyls	1.71	pg/g	0.225		
Total Trichlorobiphenyls	8.81	pg/g	0.125		
Total Tetrachlorobiphenyls	127	pg/g	0.572		
Total Pentachlorobiphenyls	905	pg/g	1.23		
Total Hexachlorobiphenyls	2310	pg/g	1.06		
Total Heptachlorobiphenyls	1290	pg/g	0.133		
Total Octachlorobiphenyls	443	pg/g	0.108		
Total Nonachlorobiphenyls	194	pg/g	0.0978		
209 - Decachlorobiphenyl	38	pg/g	0.0702		
Total Polychlorinated Biphenyls	5320	pg/g			

SLC
10-8-01

Sample Results

Sample FS-06-SB-R Fish: Black Sea Bass

Lab ID L3606-11 i Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.495	pg/g	0.158		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.462	U	ID(IR)-I
28 - 2,4,4'-Trichlorobiphenyl	5.39	pg/g	0.0636	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	15.9	pg/g	0.0648	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.08	pg/g	0.0607	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	22.1	pg/g	0.0667		
66 - 2,3',4,4'-Tetrachlorobiphenyl	36.5	pg/g	0.498		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.924	pg/g	0.572		
87 - 2,2',3,4,5-Pentachlorobiphenyl	36.1	pg/g	0.113	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	119	pg/g	0.113	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	113	pg/g	1.08		
118 - 2,3',4,4',5-Pentachlorobiphenyl	340	pg/g	0.999		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.23		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	85	pg/g	0.854	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	644	pg/g	0.824	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	932	pg/g	0.71	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	53.4	pg/g	0.553		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.756		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	130	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	333	pg/g	0.0923	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	121	pg/g	0.1	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.455	pg/g	0.0683		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	404	pg/g	0.0944		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	15.7	pg/g	0.0651		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	123	pg/g	0.0978		
209 - Decachlorobiphenyl	38	pg/g	0.0702		

SLC 10-8-01

Sample Results

Sample FS-07-SB-R

Fish: Black Sea Bass

Lab ID L3606-44R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.94	pg/g	1.15		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	116	pg/g	2.13		
114 - 2,3,4,4',5-Pentachlorobiphenyl	7.5	pg/g	1.99		
118 - 2,3',4,4',5-Pentachlorobiphenyl	346	pg/g	1.93		
123 - 2',3,4,4',5-Pentachlorobiphenyl	6.64	pg/g	2.08		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.56		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	62.4	pg/g	3.15		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	18.7	pg/g	3.25		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	29	pg/g	0.901		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.17		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	129	pg/g	0.253	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	399	pg/g	0.205	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.57	pg/g	0.371		

SLC
10-8-01

Sample Results

Sample FS-07-SB-R

Fish: Black Sea Bass

Lab ID L3606-44R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.301	pg/g	0.209		
Total Dichlorobiphenyls	2.28	pg/g	0.349		
Total Trichlorobiphenyls	23.9	pg/g	0.486		
Total Tetrachlorobiphenyls	204	pg/g	1.15		
Total Pentachlorobiphenyls	1080	pg/g	2.56		
Total Hexachlorobiphenyls	2510	pg/g	1.6		
Total Heptachlorobiphenyls	1430	pg/g	0.371		
Total Octachlorobiphenyls	864	pg/g	0.411		
Total Nonachlorobiphenyls	418	pg/g	0.324		
209 - Decachlorobiphenyl	54.1	pg/g	0.26		
Total Polychlorinated Biphenyls	6590	pg/g			

SLC 10-8-01

Sample Results

Sample FS-07-SB-R

Fish: Black Sea Bass

Lab ID L3606-44R

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.23	pg/g	0.247		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.02	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	11.6	pg/g	0.241	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	25.7	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	15.3	pg/g	0.333	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	45.9	pg/g	0.388		
66 - 2,3',4,4'-Tetrachlorobiphenyl	43.9	pg/g	1.03		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.94	pg/g	1.15		
87 - 2,2',3,4,5-Pentachlorobiphenyl	55.9	pg/g	0.231	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	185	pg/g	0.235	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	116	pg/g	2.13		
118 - 2,3',4,4',5-Pentachlorobiphenyl	346	pg/g	1.93		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.56		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	95.7	pg/g	1.21	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	626	pg/g	1.2	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1030	pg/g	1.13	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	62.4	pg/g	3.15		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.17		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	129	pg/g	0.253	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	399	pg/g	0.205	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	141	pg/g	0.231	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.791	pg/g	0.165		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	447	pg/g	0.209		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	19.7	pg/g	0.411		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	274	pg/g	0.324		
209 - Decachlorobiphenyl	54.1	pg/g	0.26		

SLC
10-8-01

Sample Results

Sample FS-08-SB-R

Fish: Black Sea Bass

Lab ID L3606-5

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.04	pg/g	0.532		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	127	pg/g	1.46		
114 - 2,3,4,4',5-Pentachlorobiphenyl	7.28	pg/g	1.44		
118 - 2,3',4,4',5-Pentachlorobiphenyl	408	pg/g	1.37		
123 - 2',3,4,4',5-Pentachlorobiphenyl	4.42	pg/g	1.46		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.84	pg/g	1.72	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.9	pg/g	1.15		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	19.3	pg/g	1.13		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	31.7	pg/g	0.957		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.13		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	145	pg/g	0.117	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	395	pg/g	0.0911	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	7.13	pg/g	0.121		

SLC 10-8-01

Sample Results

Sample FS-08-SB-R

Fish: Black Sea Bass

Lab ID L3606-5

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.465	pg/g	0.112		
Total Dichlorobiphenyls	2.63	pg/g	0.327		
Total Trichlorobiphenyls	16.1	pg/g	0.12		
Total Tetrachlorobiphenyls	192	pg/g	0.532		
Total Pentachlorobiphenyls	1190	pg/g	1.72		
Total Hexachlorobiphenyls	3090	pg/g	1.55		
Total Heptachlorobiphenyls	1580	pg/g	0.121		
Total Octachlorobiphenyls	639	pg/g	0.167		
Total Nonachlorobiphenyls	285	pg/g	0.201		
209 - Decachlorobiphenyl	47.8	pg/g	0.159		
Total Polychlorinated Biphenyls	7040	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-SB-R Fish: Black Sea Bass

Lab ID L3606-5 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.852	pg/g	0.225		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.718	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	8.99	pg/g	0.0992	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	26.2	pg/g	0.064	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	12.3	pg/g	0.0598	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	40.9	pg/g	0.0652		
66 - 2,3',4,4'-Tetrachlorobiphenyl	40.5	pg/g	0.446		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.04	pg/g	0.532		
87 - 2,2',3,4,5-Pentachlorobiphenyl	57.5	pg/g	0.273	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	184	pg/g	0.275	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	127	pg/g	1.46		
118 - 2,3',4,4',5-Pentachlorobiphenyl	408	pg/g	1.37		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.84	pg/g	1.72	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	107	pg/g	1.24	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	872	pg/g	1.23	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1270	pg/g	1.09	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	64.9	pg/g	1.15		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.13		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	145	pg/g	0.117	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	395	pg/g	0.0911	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	151	pg/g	0.102	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.3	pg/g	0.0713		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	518	pg/g	0.0949		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	17.1	pg/g	0.167		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	179	pg/g	0.201		
209 - Decachlorobiphenyl	47.8	pg/g	0.159		

SLC
10-8-01

Sample Results

Sample FS-09-SB-R

Fish: Black Sea Bass

Lab ID L3606-23R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.524	pg/g	0.44		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	82.8	pg/g	2.47		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.33	pg/g	2.38		
118 - 2,3',4,4',5-Pentachlorobiphenyl	249	pg/g	2.31		
123 - 2',3,4,4',5-Pentachlorobiphenyl	3.83	pg/g	2.57		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.12		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	44.1	pg/g	1.42		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	11.6	pg/g	1.43		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	18.3	pg/g	1.07		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	84.6	pg/g	0.0513	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	239	pg/g	0.0403	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.72	pg/g	0.152		

SLC
10-8-01

Sample Results

Sample FS-09-SB-R

Fish: Black Sea Bass

Lab ID L3606-23R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.902	pg/g	0.0729		
Total Dichlorobiphenyls	2.05	pg/g	0.202		
Total Trichlorobiphenyls	8.08	pg/g	0.0723		
Total Tetrachlorobiphenyls	115	pg/g	0.44		
Total Pentachlorobiphenyls	718	pg/g	3.12		
Total Hexachlorobiphenyls	1730	pg/g	1.7		
Total Heptachlorobiphenyls	887	pg/g	0.152		
Total Octachlorobiphenyls	368	pg/g	0.176		
Total Nonachlorobiphenyls	139	pg/g	0.0818		
209 - Decachlorobiphenyl	26.9	pg/g	0.0425		
Total Polychlorinated Biphenyls	3990	pg/g			

SLC
10-8-01

Sample Results

Sample FS-09-SB-R Fish: Black Sea Bass

Lab ID L3606-23R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.935	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	0.932	pg/g	0.052	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	4.77	pg/g	0.0527	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	16.4	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	7.45	pg/g	0.0287	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	28.2	pg/g	0.0331		
66 - 2,3',4,4'-Tetrachlorobiphenyl	24.7	pg/g	0.36		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.524	pg/g	0.44		
87 - 2,2',3,4,5-Pentachlorobiphenyl	34	pg/g	0.101	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	107	pg/g	0.103	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	82.8	pg/g	2.47		
118 - 2,3',4,4',5-Pentachlorobiphenyl	249	pg/g	2.31		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.12		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	71.4	pg/g	1.33	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	498	pg/g	1.33	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	727	pg/g	1.14	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	44.1	pg/g	1.42		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	84.6	pg/g	0.0513	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	239	pg/g	0.0403	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	89.1	pg/g	0.0451	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.552	pg/g	0.0299		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	294	pg/g	0.0413		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	11.2	pg/g	0.176		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	88.8	pg/g	0.0818		
209 - Decachlorobiphenyl	26.9	pg/g	0.0425		

SLC
10-8-01

Sample Results

Sample FS-10-SB-R

Fish: Black Sea Bass

Lab ID L3606-46R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.481		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	51	pg/g	1.1		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.77	pg/g	1.05		
118 - 2,3',4,4',5-Pentachlorobiphenyl	158	pg/g	0.981		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	1.2	U	ID(IR)-I
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.59	pg/g	1.33	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	37.1	pg/g	0.886		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	9.73	pg/g	0.856		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	11	pg/g	0.734		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.904		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	75	pg/g	0.424	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	209	pg/g	0.342	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.02	pg/g	0.274		

SLC
10-8-01

Sample Results

Sample FS-10-SB-R

Fish: Black Sea Bass

Lab ID L3606-46R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.38	pg/g	0.231		
Total Dichlorobiphenyls	1.69	pg/g	1.06		
Total Trichlorobiphenyls	ND	pg/g	3.83	U	MB-I
Total Tetrachlorobiphenyls	ND	pg/g	29	U	MB-I
Total Pentachlorobiphenyls	353	pg/g	1.33		
Total Hexachlorobiphenyls	1190	pg/g	1.26		
Total Heptachlorobiphenyls	734	pg/g	0.434		
Total Octachlorobiphenyls	348	pg/g	0.309		
Total Nonachlorobiphenyls	116	pg/g	0.34		
209 - Decachlorobiphenyl	14.5	pg/g	0.218		
Total Polychlorinated Biphenyls	2790	pg/g			

SLC
10-8-01

Sample Results

Sample FS-10-SB-R Fish: Black Sea Bass

Lab ID L3606-46R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	1.06	U	ID(IR)-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.03	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	ND	pg/g	1.8	U	ID(IR)-I
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	4.02	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	1.9	pg/g	0.352	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	6.7	pg/g	0.411		
66 - 2,3',4,4'-Tetrachlorobiphenyl	6.07	pg/g	0.429		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.481		
87 - 2,2',3,4,5-Pentachlorobiphenyl	9.58	pg/g	0.358	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	48.6	pg/g	0.363	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	51	pg/g	1.1		
118 - 2,3',4,4',5-Pentachlorobiphenyl	158	pg/g	0.981		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.59	pg/g	1.33	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	55.9	pg/g	0.956	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	255	pg/g	0.95	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	578	pg/g	0.892	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	37.1	pg/g	0.886		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.904		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	75	pg/g	0.424	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	209	pg/g	0.342	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	71.7	pg/g	0.386	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.276		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	235	pg/g	0.349		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.28	pg/g	0.237		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	71.9	pg/g	0.34		
209 - Decachlorobiphenyl	14.5	pg/g	0.218		

SLC
10-8-01

Sample Results

Sample FS-11-SB-R

Fish: Black Sea Bass

Lab ID L3606-17

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.474	pg/g	0.318		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	92.1	pg/g	1.15		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.07	pg/g	1.12		
118 - 2,3',4,4',5-Pentachlorobiphenyl	319	pg/g	1.06		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.46	pg/g	1.12		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.33		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	68.5	pg/g	0.965		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	20.6	pg/g	0.951		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	31.1	pg/g	0.844		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.973		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	155	pg/g	0.161	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	418	pg/g	0.124	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.46	pg/g	0.116		

SLC
10-8-01

Sample Results

Sample FS-11-SB-R

Fish: Black Sea Bass

Lab ID L3606-17

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.133		
Total Dichlorobiphenyls	2.19	pg/g	0.185		
Total Trichlorobiphenyls	6.03	pg/g	0.108		
Total Tetrachlorobiphenyls	50.8	pg/g	0.318		
Total Pentachlorobiphenyls	657	pg/g	1.33		
Total Hexachlorobiphenyls	2340	pg/g	1.33		
Total Heptachlorobiphenyls	1540	pg/g	0.161		
Total Octachlorobiphenyls	720	pg/g	0.218		
Total Nonachlorobiphenyls	331	pg/g	0.222		
209 - Decachlorobiphenyl	53.5	pg/g	0.123		
Total Polychlorinated Biphenyls	5700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-11-SB-R Fish: Black Sea Bass

Lab ID L3606-17 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.627	pg/g	0.135		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.589	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.46	pg/g	0.0734	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	7.61	pg/g	0.0593	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.68	pg/g	0.0555	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	10.8	pg/g	0.0612		
66 - 2,3',4,4'-Tetrachlorobiphenyl	11.5	pg/g	0.269		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.474	pg/g	0.318		
87 - 2,2',3,4,5-Pentachlorobiphenyl	17.1	pg/g	0.0959	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	83.3	pg/g	0.0965	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	92.1	pg/g	1.15		
118 - 2,3',4,4',5-Pentachlorobiphenyl	319	pg/g	1.06		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.33		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	93.5	pg/g	1.08	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	498	pg/g	1.07	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1170	pg/g	0.933	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	68.5	pg/g	0.965		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.973		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	155	pg/g	0.161	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	418	pg/g	0.124	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	140	pg/g	0.132	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.158	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	529	pg/g	0.124		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	19.2	pg/g	0.218		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	211	pg/g	0.222		
209 - Decachlorobiphenyl	53.5	pg/g	0.123		

SLC
10-8-01

Sample Results

Sample FS-12-SB-R

Fish: Black Sea Bass

Lab ID L3606-34

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.638	U	MB-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	69.6	pg/g	0.662		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.39	pg/g	0.639		
118 - 2,3',4,4',5-Pentachlorobiphenyl	217	pg/g	0.587		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.83	pg/g	0.683		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.07	pg/g	0.778		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	42.9	pg/g	0.597		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	10.9	pg/g	0.564		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	16.7	pg/g	0.393		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.451		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80.9	pg/g	0.055	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	220	pg/g	0.042	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.95	pg/g	0.0363		

SLC
10-8-01

Sample Results

Sample FS-12-SB-R

Fish: Black Sea Bass

Lab ID L3606-34

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.28	U	MB-I
Total Dichlorobiphenyls	2.99	pg/g	0.311		
Total Trichlorobiphenyls	ND	pg/g	5.84	U	MB-I
Total Tetrachlorobiphenyls	ND	pg/g	53.7	U	MB-I
Total Pentachlorobiphenyls	503	pg/g	0.778		
Total Hexachlorobiphenyls	1390	pg/g	0.623		
Total Heptachlorobiphenyls	840	pg/g	0.055		
Total Octachlorobiphenyls	397	pg/g	0.0528		
Total Nonachlorobiphenyls	157	pg/g	0.0656		
209 - Decachlorobiphenyl	27.3	pg/g	0.0394		
Total Polychlorinated Biphenyls	3380	pg/g			

SLC
10-8-01

Sample Results

Sample FS-12-SB-R Fish: Black Sea Bass

Lab ID L3606-34 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.866	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.565	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	ND	pg/g	3.03	U	MB-I
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	4.99	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	ND	pg/g	1.83	U	MB, RB-I
52 - 2,2',5,5'-Tetrachlorobiphenyl	ND	pg/g	10.3	U	MB-I
66 - 2,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	14	U	MB-I
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.638	U	MB-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	13.4	pg/g	0.0597	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	75.1	pg/g	0.06	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	69.6	pg/g	0.662		
118 - 2,3',4,4',5-Pentachlorobiphenyl	217	pg/g	0.587		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.07	pg/g	0.778		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	64.5	pg/g	0.501	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	336	pg/g	0.484	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	624	pg/g	0.424	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	42.9	pg/g	0.597		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.451		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	80.9	pg/g	0.055	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	220	pg/g	0.042	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	77.9	pg/g	0.0464	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.0308		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	285	pg/g	0.0427		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	11	pg/g	0.0528		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	95.9	pg/g	0.0656		
209 - Decachlorobiphenyl	27.3	pg/g	0.0394		

SLC
10-8-01

Sample Results

Sample FS-13-SB-R

Fish: Black Sea Bass

Lab ID L3606-16

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.989	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	83	pg/g	0.93		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.15	pg/g	0.892		
118 - 2,3',4,4',5-Pentachlorobiphenyl	240	pg/g	0.849		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.26	pg/g	0.908		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.27	pg/g	1.09	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.9	pg/g	0.923		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	12.9	pg/g	0.871		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	18.8	pg/g	0.664		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.794		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	82.1	pg/g	0.113	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	218	pg/g	0.0878	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.68	pg/g	0.0979		

SLC
10-8-01

Sample Results

Sample FS-13-SB-R

Fish: Black Sea Bass

Lab ID L3606-16

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.175	pg/g	0.0907		
Total Dichlorobiphenyls	2.35	pg/g	0.154		
Total Trichlorobiphenyls	5.66	pg/g	0.0822		
Total Tetrachlorobiphenyls	90.6	pg/g	0.32		
Total Pentachlorobiphenyls	683	pg/g	1.09		
Total Hexachlorobiphenyls	1580	pg/g	1.05		
Total Heptachlorobiphenyls	798	pg/g	0.113		
Total Octachlorobiphenyls	304	pg/g	0.107		
Total Nonachlorobiphenyls	136	pg/g	0.129		
209 - Decachlorobiphenyl	31.9	pg/g	0.0721		
Total Polychlorinated Biphenyls	3630	pg/g			

SLC
10-8-01

Sample Results

Sample FS-13-SB-R Fish: Black Sea Bass

Lab ID L3606-16 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.451	pg/g	0.115		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.453	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	4.08	pg/g	0.0546	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	12.3	pg/g	0.0685	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.85	pg/g	0.0642	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	18.8	pg/g	0.0708		
66 - 2,3',4,4'-Tetrachlorobiphenyl	22.9	pg/g	0.299		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.989	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	31.3	pg/g	0.0694	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	112	pg/g	0.0698	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	83	pg/g	0.93		
118 - 2,3',4,4',5-Pentachlorobiphenyl	240	pg/g	0.849		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.27	pg/g	1.09	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	60.7	pg/g	0.852	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	440	pg/g	0.844	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	639	pg/g	0.736	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.9	pg/g	0.923		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.794		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	82.1	pg/g	0.113	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	218	pg/g	0.0878	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	74	pg/g	0.0929	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.456	pg/g	0.0633		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	246	pg/g	0.0873		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.93	pg/g	0.09		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	85.8	pg/g	0.129		
209 - Decachlorobiphenyl	31.9	pg/g	0.0721		

SLC 10-8-01

Sample Results

Sample FS-14-SB-R

Fish: Black Sea Bass

Lab ID L3606-24

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.44	pg/g	0.861		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	126	pg/g	1.96		
114 - 2,3,4,4',5-Pentachlorobiphenyl	6.43	pg/g	1.83		
118 - 2,3',4,4',5-Pentachlorobiphenyl	370	pg/g	1.77		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.64	pg/g	1.92		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.34		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	46.6	pg/g	1.4		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	16	pg/g	1.31		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	25.6	pg/g	0.5		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.602		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	106	pg/g	0.0925	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	288	pg/g	0.0721	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.38	pg/g	0.0993		

SLC 10-8-01

Sample Results

Sample FS-14-SB-R

Fish: Black Sea Bass

Lab ID L3606-24

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.732	U	MB-I
Total Dichlorobiphenyls	2.05	pg/g	0.552		
Total Trichlorobiphenyls	ND	pg/g	16.3	U	MB-I
Total Tetrachlorobiphenyls	214	pg/g	0.861		
Total Pentachlorobiphenyls	1160	pg/g	2.34		
Total Hexachlorobiphenyls	2460	pg/g	0.797		
Total Heptachlorobiphenyls	1250	pg/g	0.0993		
Total Octachlorobiphenyls	652	pg/g	0.169		
Total Nonachlorobiphenyls	363	pg/g	0.129		
209 - Decachlorobiphenyl	101	pg/g	0.0542		
Total Polychlorinated Biphenyls	6220	pg/g			

SLC
10-8-01

Sample Results

Sample FS-14-SB-R Fish: Black Sea Bass

Lab ID L3606-24 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	0.875	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	0.898	pg/g	0.0843	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	ND	pg/g	8.42	U	MB-I
44 - 2,2',3,5'-Tetrachlorobiphenyl	26.6	pg/g	0.0941	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	13.5	pg/g	0.0881	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	35.6	pg/g	0.0997		
66 - 2,3',4,4'-Tetrachlorobiphenyl	51.4	pg/g	0.761		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.44	pg/g	0.861		
87 - 2,2',3,4,5-Pentachlorobiphenyl	64	pg/g	0.131	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	186	pg/g	0.131	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	126	pg/g	1.96		
118 - 2,3',4,4',5-Pentachlorobiphenyl	370	pg/g	1.77		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.34		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	96	pg/g	0.65	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	645	pg/g	0.619	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	986	pg/g	0.553	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	46.6	pg/g	1.4		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.602		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	106	pg/g	0.0925	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	288	pg/g	0.0721	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	122	pg/g	0.0791	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.503	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	446	pg/g	0.075		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	18.7	pg/g	0.169		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	229	pg/g	0.129		
209 - Decachlorobiphenyl	101	pg/g	0.0542		

SLC 10-8-01

Sample Results

Sample FS-15-SB-R

Fish: Black Sea Bass

Lab ID L3606-48R i

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.12		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	56.2	pg/g	1.26		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.07	pg/g	1.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	192	pg/g	1.13		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	1.56	U	ID(IR)-I
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.49		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	38.4	pg/g	1.53		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	11.9	pg/g	1.57		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	17.4	pg/g	1.42		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.68		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	94.2	pg/g	1.01	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	280	pg/g	0.792	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.96	pg/g	0.486		

SLC 10-8-01

Sample Results

Sample FS-15-SB-R

Fish: Black Sea Bass

Lab ID L3606-48R i

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.754	pg/g	0.29		
Total Dichlorobiphenyls	1.87	pg/g	0.822		
Total Trichlorobiphenyls	ND	pg/g	4.45	U	MB-I
Total Tetrachlorobiphenyls	60.5	pg/g	1.12		
Total Pentachlorobiphenyls	486	pg/g	1.49		
Total Hexachlorobiphenyls	1620	pg/g	2.23		
Total Heptachlorobiphenyls	974	pg/g	1.01		
Total Octachlorobiphenyls	547	pg/g	0.97		
Total Nonachlorobiphenyls	203	pg/g	0.814		
209 - Decachlorobiphenyl	43.4	pg/g	0.919		
Total Polychlorinated Biphenyls	3940	pg/g			

SLC 10-8-01

Sample Results

Sample FS-15-SB-R Fish: Black Sea Bass

Lab ID L3606-48R i Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.856	pg/g	0.536		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.02	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.43	pg/g	0.398	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	8.95	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	4.82	pg/g	0.473	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	11.3	pg/g	0.54		
66 - 2,3',4,4'-Tetrachlorobiphenyl	15.7	pg/g	0.96		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.12		
87 - 2,2',3,4,5-Pentachlorobiphenyl	19.5	pg/g	0.578	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	72.2	pg/g	0.59	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	56.2	pg/g	1.26		
118 - 2,3',4,4',5-Pentachlorobiphenyl	192	pg/g	1.13		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.49		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	55.1	pg/g	1.82	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	400	pg/g	1.81	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	770	pg/g	1.62	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	38.4	pg/g	1.53		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.68		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	94.2	pg/g	1.01	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	280	pg/g	0.792	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	96.5	pg/g	0.845	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.605		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	330	pg/g	0.799		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	16.7	pg/g	0.796		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	126	pg/g	0.814		
209 - Decachlorobiphenyl	43.4	pg/g	0.919		

SLC 10-8-01

Sample Results

Sample FS-16-SB-R

Fish: Black Sea Bass

Lab ID L3606-4

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.366	pg/g	0.152		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	74.3	pg/g	0.425		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.91	pg/g	0.422		
118 - 2,3',4,4',5-Pentachlorobiphenyl	233	pg/g	0.393		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.47	pg/g	0.428		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.726	pg/g	0.489	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	50.8	pg/g	0.514		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	13	pg/g	0.507		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	17.7	pg/g	0.457		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.531		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	90.9	pg/g	0.151	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	245	pg/g	0.117	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.97	pg/g	0.108		

SLC
10-8-01

Sample Results

Sample FS-16-SB-R

Fish: Black Sea Bass

Lab ID L3606-4

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.12		
Total Dichlorobiphenyls	2.35	pg/g	0.362		
Total Trichlorobiphenyls	ND	pg/g	4.58	U	MB-I
Total Tetrachlorobiphenyls	50.2	pg/g	0.152		
Total Pentachlorobiphenyls	522	pg/g	0.5		
Total Hexachlorobiphenyls	1550	pg/g	0.741		
Total Heptachlorobiphenyls	908	pg/g	0.151		
Total Octachlorobiphenyls	358	pg/g	0.169		
Total Nonachlorobiphenyls	150	pg/g	0.186		
209 - Decachlorobiphenyl	29.1	pg/g	0.241		
Total Polychlorinated Biphenyls	3570	pg/g			

SLC
10-8-01

Sample Results

Sample FS-16-SB-R Fish: Black Sea Bass

Lab ID L3606-4 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.619	pg/g	0.253		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.481	U	ID(IR), MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.34	pg/g	0.0867	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	7.25	pg/g	0.113	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	2.63	pg/g	0.106	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	9.17	pg/g	0.116		
66 - 2,3',4,4'-Tetrachlorobiphenyl	14.6	pg/g	0.124		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.366	pg/g	0.152		
87 - 2,2',3,4,5-Pentachlorobiphenyl	15.5	pg/g	0.22	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	76.8	pg/g	0.222	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	74.3	pg/g	0.425		
118 - 2,3',4,4',5-Pentachlorobiphenyl	233	pg/g	0.393		
126 - 3,3',4,4',5-Pentachlorobiphenyl	0.726	pg/g	0.489	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	62.7	pg/g	0.594	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	344	pg/g	0.59	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	725	pg/g	0.521	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	50.8	pg/g	0.514		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.531		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	90.9	pg/g	0.151	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	245	pg/g	0.117	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	84.7	pg/g	0.131	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.0919		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	297	pg/g	0.122		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	10.7	pg/g	0.0959		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	95.1	pg/g	0.186		
209 - Decachlorobiphenyl	29.1	pg/g	0.241		

SLC
10-8-01

Sample Results

Sample FS-17-SB-R

Fish: Black Sea Bass

Lab ID L3606-42R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.18		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	77.2	pg/g	2.44		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.09	pg/g	2.25		
118 - 2,3',4,4',5-Pentachlorobiphenyl	234	pg/g	2.38		
123 - 2',3,4,4',5-Pentachlorobiphenyl	3.39	pg/g	2.4		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.27		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.8	pg/g	1.82		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	13.4	pg/g	1.88		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	17.2	pg/g	0.914		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.15		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	81.6	pg/g	0.574	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	230	pg/g	0.464	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.98	pg/g	0.341		

SLC
10-8-01

Sample Results

Sample FS-17-SB-R

Fish: Black Sea Bass

Lab ID L3606-42R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.02	pg/g	0.18		
Total Dichlorobiphenyls	2.45	pg/g	0.628		
Total Trichlorobiphenyls	6.84	pg/g	0.827		
Total Tetrachlorobiphenyls	61.8	pg/g	1.18		
Total Pentachlorobiphenyls	552	pg/g	3.27		
Total Hexachlorobiphenyls	1540	pg/g	1.65		
Total Heptachlorobiphenyls	738	pg/g	0.588		
Total Octachlorobiphenyls	321	pg/g	0.562		
Total Nonachlorobiphenyls	135	pg/g	0.434		
209 - Decachlorobiphenyl	30.9	pg/g	0.335		
Total Polychlorinated Biphenyls	3390	pg/g			

SLC
10-8-01

Sample Results

Sample FS-17-SB-R Fish: Black Sea Bass

Lab ID L3606-42R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.06	pg/g	0.409		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.788	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	3.7	pg/g	0.199	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	7.65	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	3.13	pg/g	0.289	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	13.6	pg/g	0.337		
66 - 2,3',4,4'-Tetrachlorobiphenyl	16.1	pg/g	1.08		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	1.18		
87 - 2,2',3,4,5-Pentachlorobiphenyl	20.2	pg/g	0.287	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	74.9	pg/g	0.291	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	77.2	pg/g	2.44		
118 - 2,3',4,4',5-Pentachlorobiphenyl	234	pg/g	2.38		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.27		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	63.6	pg/g	1.25	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	429	pg/g	1.25	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	710	pg/g	1.17	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.8	pg/g	1.82		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.15		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	81.6	pg/g	0.574	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	230	pg/g	0.464	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	79.4	pg/g	0.523	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.375		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	208	pg/g	0.473		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	10.2	pg/g	0.418		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	90.9	pg/g	0.434		
209 - Decachlorobiphenyl	30.9	pg/g	0.335		

SLC 10-8-01

Sample Results

Sample FS-18-SB-R

Fish: Black Sea Bass

Lab ID L3606-7

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.866	pg/g	0.3		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	66	pg/g	0.704		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.69	pg/g	0.672		
118 - 2,3',4,4',5-Pentachlorobiphenyl	188	pg/g	0.664		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.95	pg/g	0.694		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.828		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	31.7	pg/g	0.617		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.97	pg/g	0.587		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	12.9	pg/g	0.71		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.82		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	56.4	pg/g	0.107	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	150	pg/g	0.083	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.73	pg/g	0.0689		

SLC
10-8-01

Sample Results

Sample FS-18-SB-R

Fish: Black Sea Bass

Lab ID L3606-7

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.15	pg/g	0.112		
Total Dichlorobiphenyls	1.7	pg/g	0.267		
Total Trichlorobiphenyls	7.71	pg/g	0.11		
Total Tetrachlorobiphenyls	87.9	pg/g	0.3		
Total Pentachlorobiphenyls	587	pg/g	0.828		
Total Hexachlorobiphenyls	1210	pg/g	1.14		
Total Heptachlorobiphenyls	592	pg/g	0.107		
Total Octachlorobiphenyls	281	pg/g	0.118		
Total Nonachlorobiphenyls	134	pg/g	0.13		
209 - Decachlorobiphenyl	23.1	pg/g	0.12		
Total Polychlorinated Biphenyls	2930	pg/g			

SLC 10-8-01

Sample Results

Sample FS-18-SB-R Fish: Black Sea Bass

Lab ID L3606-7 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.621	pg/g	0.205		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.427	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	4.16	pg/g	0.0553	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	11.8	pg/g	0.0803	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.41	pg/g	0.075	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	19.9	pg/g	0.0819		
66 - 2,3',4,4'-Tetrachlorobiphenyl	17.3	pg/g	0.246		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.866	pg/g	0.3		
87 - 2,2',3,4,5-Pentachlorobiphenyl	30.5	pg/g	0.214	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	97.4	pg/g	0.215	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	66	pg/g	0.704		
118 - 2,3',4,4',5-Pentachlorobiphenyl	188	pg/g	0.664		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.828		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	48.7	pg/g	0.916	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	334	pg/g	0.909	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	470	pg/g	0.803	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	31.7	pg/g	0.617		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.82		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	56.4	pg/g	0.107	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	150	pg/g	0.083	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	54.8	pg/g	0.0926	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.573	pg/g	0.065		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	188	pg/g	0.0865		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	8.06	pg/g	0.112		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	83.8	pg/g	0.13		
209 - Decachlorobiphenyl	23.1	pg/g	0.12		

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10-8-01

Sample Results

Sample FS-19-SB-R

Fish: Black Sea Bass

Lab ID L3606-2 i

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.432		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	45.7	pg/g	0.7		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.88	pg/g	0.651		
118 - 2,3',4,4',5-Pentachlorobiphenyl	138	pg/g	0.645		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	0.635		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.39	pg/g	0.91		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	27.8	pg/g	0.773		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.37	pg/g	0.757		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	9.82	pg/g	0.489		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.636		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	58.3	pg/g	0.157	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	178	pg/g	0.12	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.11	pg/g	0.134		

SLC
10-8-01

Sample Results

Sample FS-19-SB-R

Fish: Black Sea Bass

Lab ID L3606-2 i

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.377	pg/g	0.142		
Total Dichlorobiphenyls	1.6	pg/g	0.317		
Total Trichlorobiphenyls	ND	pg/g	2.72	U	MB-I
Total Tetrachlorobiphenyls	37	pg/g	0.432		
Total Pentachlorobiphenyls	318	pg/g	0.91		
Total Hexachlorobiphenyls	926	pg/g	0.78		
Total Heptachlorobiphenyls	680	pg/g	0.157		
Total Octachlorobiphenyls	428	pg/g	0.204		
Total Nonachlorobiphenyls	230	pg/g	0.256		
209 - Decachlorobiphenyl	37.2	pg/g	0.123		
Total Polychlorinated Biphenyls	2660	pg/g			

JLC
10-8-01

Sample Results

Sample FS-19-SB-R Fish: Black Sea Bass

Lab ID L3606-2 i Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.659	pg/g	0.235		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.571	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	1.83	pg/g	0.135	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	4.6	pg/g	0.136	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	ND	pg/g	1.65	U	RB-I
52 - 2,2',5,5'-Tetrachlorobiphenyl	7.66	pg/g	0.14		
66 - 2,3',4,4'-Tetrachlorobiphenyl	9.78	pg/g	0.354		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.432		
87 - 2,2',3,4,5-Pentachlorobiphenyl	9.49	pg/g	0.121	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	45.7	pg/g	0.121	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	45.7	pg/g	0.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	138	pg/g	0.645		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.39	pg/g	0.91		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	36.3	pg/g	0.628	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	202	pg/g	0.606	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	459	pg/g	0.522	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	27.8	pg/g	0.773		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.636		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	58.3	pg/g	0.157	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	178	pg/g	0.12	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	67.7	pg/g	0.13	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.0886		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	250	pg/g	0.123		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	11	pg/g	0.204		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	152	pg/g	0.256		
209 - Decachlorobiphenyl	37.2	pg/g	0.123		

JLC
20-8-01

Sample Results

Sample FS-20-SB-R

Fish: Black Sea Bass

Lab ID L3606-3

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.583	pg/g	0.361		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	57.1	pg/g	0.848		
114 - 2,3,4,4',5-Pentachlorobiphenyl	3.03	pg/g	0.828		
118 - 2,3',4,4',5-Pentachlorobiphenyl	172	pg/g	0.821		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.71	pg/g	0.87		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.994		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	29.6	pg/g	0.286		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.6	pg/g	0.277		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	13.7	pg/g	0.338		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.392		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.7	pg/g	0.11	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	186	pg/g	0.0856	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.09	pg/g	0.0902		

SLC
10-8-01

Sample Results

Sample FS-20-SB-R

Fish: Black Sea Bass

Lab ID L3606-3

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.496	pg/g	0.09		
Total Dichlorobiphenyls	1.36	pg/g	0.305		
Total Trichlorobiphenyls	5.42	pg/g	0.112		
Total Tetrachlorobiphenyls	73.3	pg/g	0.361		
Total Pentachlorobiphenyls	482	pg/g	0.994		
Total Hexachlorobiphenyls	1260	pg/g	0.548		
Total Heptachlorobiphenyls	756	pg/g	0.11		
Total Octachlorobiphenyls	297	pg/g	0.0976		
Total Nonachlorobiphenyls	171	pg/g	0.145		
209 - Decachlorobiphenyl	53.5	pg/g	0.125		
Total Polychlorinated Biphenyls	3100	pg/g			

SLC
10-8-01

Sample Results

Sample FS-20-SB-R Fish: Black Sea Bass

Lab ID L3606-3 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	0.566	pg/g	0.213		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	0.453	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	2.93	pg/g	0.0675	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	9.79	pg/g	0.0674	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	3.82	pg/g	0.063	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	15	pg/g	0.0687		
66 - 2,3',4,4'-Tetrachlorobiphenyl	17.6	pg/g	0.297		
77 - 3,3',4,4'-Tetrachlorobiphenyl	0.583	pg/g	0.361		
87 - 2,2',3,4,5-Pentachlorobiphenyl	20.9	pg/g	0.154	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	97.3	pg/g	0.155	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	57.1	pg/g	0.848		
118 - 2,3',4,4',5-Pentachlorobiphenyl	172	pg/g	0.821		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.994		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	46.9	pg/g	0.439	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	291	pg/g	0.436	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	536	pg/g	0.385	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	29.6	pg/g	0.286		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.392		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	67.7	pg/g	0.11	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	186	pg/g	0.0856	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	67.7	pg/g	0.0954	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.128	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	240	pg/g	0.0892		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	10.1	pg/g	0.073		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	103	pg/g	0.145		
209 - Decachlorobiphenyl	53.5	pg/g	0.125		

SLC
10-8-01

Sample Results

Sample FS-01-SB-T

Fish: Black Sea Bass

Lab ID L3606-6

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.1	pg/g	2.5		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	407	pg/g	1.7		
114 - 2,3,4,4',5-Pentachlorobiphenyl	19	pg/g	1.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1280	pg/g	1.7		
123 - 2',3,4,4',5-Pentachlorobiphenyl	16.4	pg/g	1.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.2	pg/g	1.7	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	150	pg/g	1.74		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	46.3	pg/g	1.76		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	74.3	pg/g	0.756		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.881		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	233	pg/g	0.162	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	588	pg/g	0.126	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	10.4	pg/g	0.183		

SLC
10-8-01

Sample Results

Sample FS-01-SB-T

Fish: Black Sea Bass

Lab ID L3606-6

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.684	pg/g	0.0864		
Total Dichlorobiphenyls	5.81	pg/g	0.337		
Total Trichlorobiphenyls	61.7	pg/g	0.161		
Total Tetrachlorobiphenyls	996	pg/g	2.5		
Total Pentachlorobiphenyls	4590	pg/g	1.7		
Total Hexachlorobiphenyls	5900	pg/g	1.21		
Total Heptachlorobiphenyls	2210	pg/g	0.183		
Total Octachlorobiphenyls	698	pg/g	0.211		
Total Nonachlorobiphenyls	300	pg/g	0.15		
209 - Decachlorobiphenyl	92.4	pg/g	0.193		
Total Polychlorinated Biphenyls	14900	pg/g			

SLC
10-8-01

Sample Results

Sample FS-01-SB-T Fish: Black Sea Bass

Lab ID L3606-6 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.83	pg/g	0.238		
18 - 2,2',5-Trichlorobiphenyl	3.67	pg/g	0.117	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	22.3	pg/g	0.0873	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	122	pg/g	0.0975	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	74.7	pg/g	0.0911	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	301	pg/g	0.0994		
66 - 2,3',4,4'-Tetrachlorobiphenyl	144	pg/g	2.07		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.1	pg/g	2.5		
87 - 2,2',3,4,5-Pentachlorobiphenyl	301	pg/g	0.401	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	813	pg/g	0.404	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	407	pg/g	1.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1280	pg/g	1.7		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.2	pg/g	1.7	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	242	pg/g	0.973	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1590	pg/g	0.966	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2240	pg/g	0.854	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	150	pg/g	1.74		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.881		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	233	pg/g	0.162	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	588	pg/g	0.126	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	211	pg/g	0.14	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.34	pg/g	0.0985		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	640	pg/g	0.131		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	29	pg/g	0.211		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	183	pg/g	0.15		
209 - Decachlorobiphenyl	92.4	pg/g	0.193		

SLC 10-8-01

Sample Results

Sample FS-02-SB-T

Fish: Black Sea Bass

Lab ID L3606-27

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	13	pg/g	3.6		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1140	pg/g	11.4		
114 - 2,3,4,4',5-Pentachlorobiphenyl	70.7	pg/g	11.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3660	pg/g	10.5		
123 - 2',3,4,4',5-Pentachlorobiphenyl	38.2	pg/g	12.3		
126 - 3,3',4,4',5-Pentachlorobiphenyl	17.9	pg/g	11.9		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	466	pg/g	1.32		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	127	pg/g	1.26		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	225	pg/g	1.94		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	652	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1730	pg/g	0.101	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	25.6	pg/g	0.323		

SLC
10-8-01

Sample Results

Sample FS-02-SB-T

Fish: Black Sea Bass

Lab ID L3606-27

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.83	pg/g	0.137		
Total Dichlorobiphenyls	19.1	pg/g	0.488		
Total Trichlorobiphenyls	210	pg/g	0.138		
Total Tetrachlorobiphenyls	2940	pg/g	3.6		
Total Pentachlorobiphenyls	14100	pg/g	14.7		
Total Hexachlorobiphenyls	19500	pg/g	3.05		
Total Heptachlorobiphenyls	6910	pg/g	0.323		
Total Octachlorobiphenyls	2260	pg/g	0.322		
Total Nonachlorobiphenyls	622	pg/g	0.239		
209 - Decachlorobiphenyl	102	pg/g	0.0477		
Total Polychlorinated Biphenyls	46700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-02-SB-T Fish: Black Sea Bass

Lab ID L3606-27 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.55	pg/g	0.361		
18 - 2,2',5-Trichlorobiphenyl	17.8	pg/g	0.0903	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	65.2	pg/g	0.125	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	331	pg/g	0.0804	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	236	pg/g	0.0753	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	841	pg/g	0.0852		
66 - 2,3',4,4'-Tetrachlorobiphenyl	439	pg/g	3.26		
77 - 3,3',4,4'-Tetrachlorobiphenyl	13	pg/g	3.6		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1060	pg/g	1.07	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2670	pg/g	1.06	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1140	pg/g	11.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3660	pg/g	10.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	17.9	pg/g	11.9		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	818	pg/g	2.49	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5520	pg/g	2.37	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6880	pg/g	2.12	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	466	pg/g	1.32		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	652	pg/g	0.13	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1730	pg/g	0.101	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	645	pg/g	0.111	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.44	pg/g	0.0749		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2110	pg/g	0.105		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	89.4	pg/g	0.322		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	390	pg/g	0.239		
209 - Decachlorobiphenyl	102	pg/g	0.0477		

SLC
10-8-01

Sample Results

Sample FS-03-SB-T

Fish: Black Sea Bass

Lab ID L3606-50R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	16.3	pg/g	4.33		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1510	pg/g	2.08		
114 - 2,3,4,4',5-Pentachlorobiphenyl	89.5	pg/g	2.19		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4430	pg/g	1.85		
123 - 2',3,4,4',5-Pentachlorobiphenyl	70	pg/g	2.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.5		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	524	pg/g	2.88		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	138	pg/g	2.86		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	232	pg/g	9.27		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	11.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	725	pg/g	0.2	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1990	pg/g	0.155	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	30.9	pg/g	0.576		

SLC
10-8-01

Sample Results

Sample FS-03-SB-T

Fish: Black Sea Bass

Lab ID L3606-50R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.44	pg/g	0.106		
Total Dichlorobiphenyls	28.8	pg/g	0.689		
Total Trichlorobiphenyls	318	pg/g	0.273		
Total Tetrachlorobiphenyls	4120	pg/g	4.33		
Total Pentachlorobiphenyls	17900	pg/g	4.5		
Total Hexachlorobiphenyls	21400	pg/g	14.1		
Total Heptachlorobiphenyls	7560	pg/g	0.576		
Total Octachlorobiphenyls	3240	pg/g	0.816		
Total Nonachlorobiphenyls	1110	pg/g	0.735		
209 - Decachlorobiphenyl	148	pg/g	0.322		
Total Polychlorinated Biphenyls	55800	pg/g			

JLC
10-8-01

Sample Results

Sample FS-03-SB-T Fish: Black Sea Bass

Lab ID L3606-50R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	7.82	pg/g	0.453		
18 - 2,2',5-Trichlorobiphenyl	27.1	pg/g	0.218	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	87.8	pg/g	0.187	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	451	pg/g	0.13	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	316	pg/g	0.118	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	1230	pg/g	0.141		
66 - 2,3',4,4'-Tetrachlorobiphenyl	541	pg/g	3.75		
77 - 3,3',4,4'-Tetrachlorobiphenyl	16.3	pg/g	4.33		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1290	pg/g	0.467	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	3070	pg/g	0.473	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1510	pg/g	2.08		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4430	pg/g	1.85		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.5		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	816	pg/g	11.1	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	6210	pg/g	11.2	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	7490	pg/g	9.79	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	524	pg/g	2.88		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	11.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	725	pg/g	0.2	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1990	pg/g	0.155	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	744	pg/g	0.17	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	7.86	pg/g	0.116		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2250	pg/g	0.156		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	89.7	pg/g	0.816		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	700	pg/g	0.735		
209 - Decachlorobiphenyl	148	pg/g	0.322		

SLC
10-8-01

Sample Results

Sample FS-04-SB-T

Fish: Black Sea Bass

Lab ID L3606-47R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.96	pg/g	1.26		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1620	pg/g	4.18		
114 - 2,3,4,4',5-Pentachlorobiphenyl	92.5	pg/g	4.34		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4490	pg/g	3.57		
123 - 2',3,4,4',5-Pentachlorobiphenyl	57.4	pg/g	4.35		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.49		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	528	pg/g	8.78		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	140	pg/g	8.75		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	201	pg/g	2.51		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	3.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	458	pg/g	0.231	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	961	pg/g	0.179	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	14.6	pg/g	0.327		

SLC
10-8-01

Sample Results

Sample FS-04-SB-T

Fish: Black Sea Bass

Lab ID L3606-47R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.8	pg/g	0.0898		
Total Dichlorobiphenyls	17.2	pg/g	0.313		
Total Trichlorobiphenyls	197	pg/g	0.272		
Total Tetrachlorobiphenyls	3460	pg/g	1.26		
Total Pentachlorobiphenyls	16300	pg/g	5.49		
Total Hexachlorobiphenyls	16300	pg/g	4.06		
Total Heptachlorobiphenyls	3240	pg/g	0.327		
Total Octachlorobiphenyls	803	pg/g	0.266		
Total Nonachlorobiphenyls	264	pg/g	0.26		
209 - Decachlorobiphenyl	58.4	pg/g	0.164		
Total Polychlorinated Biphenyls	40600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-SB-T Fish: Black Sea Bass

Lab ID L3606-47R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.18	pg/g	0.205		
18 - 2,2',5-Trichlorobiphenyl	15.6	pg/g	0.136	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	47.8	pg/g	0.233	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	325	pg/g	0.118	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	274	pg/g	0.107	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	1170	pg/g	0.128		
66 - 2,3',4,4'-Tetrachlorobiphenyl	422	pg/g	1.26		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.96	pg/g	1.26		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1050	pg/g	0.535	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	3260	pg/g	0.542	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1620	pg/g	4.18		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4490	pg/g	3.57		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.49		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	769	pg/g	3.21	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4670	pg/g	3.23	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	5630	pg/g	2.83	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	528	pg/g	8.78		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	3.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	458	pg/g	0.231	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	961	pg/g	0.179	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	308	pg/g	0.197	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.83	pg/g	0.134		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	719	pg/g	0.181		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	31.2	pg/g	0.266		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	160	pg/g	0.26		
209 - Decachlorobiphenyl	58.4	pg/g	0.164		

SLC
10-6-01

Sample Results

Sample FS-05-SB-T

Fish: Black Sea Bass

Lab ID L3606-53R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.69	pg/g	1.2		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	339	pg/g	5.11		
114 - 2,3,4,4',5-Pentachlorobiphenyl	21.7	pg/g	5.11		
118 - 2,3',4,4',5-Pentachlorobiphenyl	950	pg/g	4.63		
123 - 2',3,4,4',5-Pentachlorobiphenyl	10.7	pg/g	5.21		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.54		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	115	pg/g	3.44		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	30.3	pg/g	3.65		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	43.9	pg/g	1.32		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.63		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	127	pg/g	0.0397	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	311	pg/g	0.0312	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.28	pg/g	0.162		

SLC 10-8-01

Sample Results

Sample FS-05-SB-T

Fish: Black Sea Bass

Lab ID L3606-53R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.914	pg/g	0.052		
Total Dichlorobiphenyls	13.1	pg/g	0.145		
Total Trichlorobiphenyls	104	pg/g	0.144		
Total Tetrachlorobiphenyls	884	pg/g	1.2		
Total Pentachlorobiphenyls	3590	pg/g	6.54		
Total Hexachlorobiphenyls	3820	pg/g	2.14		
Total Heptachlorobiphenyls	1140	pg/g	0.162		
Total Octachlorobiphenyls	352	pg/g	0.102		
Total Nonachlorobiphenyls	101	pg/g	0.0548		
209 - Decachlorobiphenyl	18.8	pg/g	0.0349		
Total Polychlorinated Biphenyls	10000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-SB-T Fish: Black Sea Bass

Lab ID L3606-53R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.73	pg/g	0.0937		
18 - 2,2',5-Trichlorobiphenyl	20.1	pg/g	0.0405	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	14	pg/g	0.11	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	97.6	pg/g	0.0332	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	74.4	pg/g	0.0306	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	281	pg/g	0.0353		
66 - 2,3',4,4'-Tetrachlorobiphenyl	102	pg/g	1.04		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.69	pg/g	1.2		
87 - 2,2',3,4,5-Pentachlorobiphenyl	251	pg/g	0.909	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	610	pg/g	0.918	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	339	pg/g	5.11		
118 - 2,3',4,4',5-Pentachlorobiphenyl	950	pg/g	4.63		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	6.54		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	177	pg/g	1.67	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1090	pg/g	1.67	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1350	pg/g	1.43	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	115	pg/g	3.44		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.63		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	127	pg/g	0.0397	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	311	pg/g	0.0312	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	110	pg/g	0.0349	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.815	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	331	pg/g	0.0319		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	12.1	pg/g	0.102		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	62.8	pg/g	0.0548		
209 - Decachlorobiphenyl	18.8	pg/g	0.0349		

SLC
10-8-01

Sample Results

Sample FS-06-SB-T

Fish: Black Sea Bass

Lab ID L3606-13

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	15.7	pg/g	1.5		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1360	pg/g	1.11		
114 - 2,3,4,4',5-Pentachlorobiphenyl	62.2	pg/g	1.07		
118 - 2,3',4,4',5-Pentachlorobiphenyl	5720	pg/g	0.905		
123 - 2',3,4,4',5-Pentachlorobiphenyl	37.3	pg/g	1.13		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.69	pg/g	1.34	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	415	pg/g	1.05		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	96.1	pg/g	1.06		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	221	pg/g	1.01		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.24		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	387	pg/g	0.171	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1020	pg/g	0.131	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	15.2	pg/g	0.274		

SLC
10-8-01

Sample Results

Sample FS-06-SB-T

Fish: Black Sea Bass

Lab ID L3606-13

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.17	pg/g	0.117		
Total Dichlorobiphenyls	25.3	pg/g	0.192		
Total Trichlorobiphenyls	356	pg/g	0.152		
Total Tetrachlorobiphenyls	5190	pg/g	8.01		
Total Pentachlorobiphenyls	20400	pg/g	1.34		
Total Hexachlorobiphenyls	17600	pg/g	1.31		
Total Heptachlorobiphenyls	3820	pg/g	0.274		
Total Octachlorobiphenyls	1090	pg/g	0.215		
Total Nonachlorobiphenyls	301	pg/g	0.156		
209 - Decachlorobiphenyl	38.2	pg/g	0.102		
Total Polychlorinated Biphenyls	48800	pg/g			

glc 10-8-01

Sample Results

Sample FS-06-SB-T Fish: Black Sea Bass

Lab ID L3606-13 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.41	pg/g	0.142		
18 - 2,2',5-Trichlorobiphenyl	35.9	pg/g	0.108	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	67.7	pg/g	0.0921	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	452	pg/g	0.0725	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	488	pg/g	0.068	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	2000	pg/g	0.0747		
66 - 2,3',4,4'-Tetrachlorobiphenyl	569	pg/g	1.5		
77 - 3,3',4,4'-Tetrachlorobiphenyl	15.7	pg/g	1.5		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1330	pg/g	0.341	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	4480	pg/g	0.34	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1360	pg/g	1.11		
118 - 2,3',4,4',5-Pentachlorobiphenyl	5720	pg/g	0.905		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.69	pg/g	1.34	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	794	pg/g	1.31	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4820	pg/g	1.31	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6510	pg/g	1.31	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	415	pg/g	1.05		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.24		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	387	pg/g	0.171	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1020	pg/g	0.131	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	351	pg/g	0.142	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.01	pg/g	0.0967		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1020	pg/g	0.134		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	46.2	pg/g	0.215		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	191	pg/g	0.156		
209 - Decachlorobiphenyl	38.2	pg/g	0.102		

SLC
10-8-01

Sample Results

Sample FS-07-SB-T

Fish: Black Sea Bass

Lab ID L3606-22

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	21.9	pg/g	3.74		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2060	pg/g	24.9		
114 - 2,3,4,4',5-Pentachlorobiphenyl	188	pg/g	26.1		
118 - 2,3',4,4',5-Pentachlorobiphenyl	9390	pg/g	34.5		
123 - 2',3,4,4',5-Pentachlorobiphenyl	98.6	pg/g	25.9		
126 - 3,3',4,4',5-Pentachlorobiphenyl	17.4	pg/g	15.3		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	1050	pg/g	1.49		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	253	pg/g	1.5		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	446	pg/g	4.19		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.99		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	763	pg/g	0.258	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2160	pg/g	0.201	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	34.8	pg/g	0.36		

SLC
10-8-01

Sample Results

Sample FS-07-SB-T

Fish: Black Sea Bass

Lab ID L3606-22

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.72	pg/g	0.207		
Total Dichlorobiphenyls	34.8	pg/g	0.798		
Total Trichlorobiphenyls	511	pg/g	0.34		
Total Tetrachlorobiphenyls	8400	pg/g	3.84		
Total Pentachlorobiphenyls	36000	pg/g	31.2		
Total Hexachlorobiphenyls	32600	pg/g	6.86		
Total Heptachlorobiphenyls	7850	pg/g	0.36		
Total Octachlorobiphenyls	2600	pg/g	0.366		
Total Nonachlorobiphenyls	575	pg/g	0.13		
209 - Decachlorobiphenyl	52.1	pg/g	0.0523		
Total Polychlorinated Biphenyls	88600	pg/g			

SLC
10-8-01

Sample Results

Sample FS-07-SB-T Fish: Black Sea Bass

Lab ID L3606-22 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	9.89	pg/g	0.545		
18 - 2,2',5-Trichlorobiphenyl	27.6	pg/g	0.108	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	128	pg/g	0.31	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	872	pg/g	0.134	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	548	pg/g	0.126	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	2840	pg/g	0.142		
66 - 2,3',4,4'-Tetrachlorobiphenyl	814	pg/g	3.54		
77 - 3,3',4,4'-Tetrachlorobiphenyl	21.9	pg/g	3.74		
87 - 2,2',3,4,5-Pentachlorobiphenyl	2640	pg/g	0.794	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	6780	pg/g	0.791	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2060	pg/g	24.9		
118 - 2,3',4,4',5-Pentachlorobiphenyl	9390	pg/g	34.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	17.4	pg/g	15.3		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1350	pg/g	5.59	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	8420	pg/g	5.33	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	10400	pg/g	4.76	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	1050	pg/g	1.49		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.99		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	763	pg/g	0.258	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2160	pg/g	0.201	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	759	pg/g	0.221	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	5.42	pg/g	0.149		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2230	pg/g	0.209		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	124	pg/g	0.366		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	369	pg/g	0.13		
209 - Decachlorobiphenyl	52.1	pg/g	0.0523		

SLC
10-8-01

Sample Results

Sample FS-08-SB-T

Fish: Black Sea Bass

Lab ID L3606-21

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.75	pg/g	2.15		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2060	pg/g	2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	119	pg/g	2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	5530	pg/g	2		
123 - 2',3,4,4',5-Pentachlorobiphenyl	69.5	pg/g	2		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.55		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	937	pg/g	6.81		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	204	pg/g	6.48		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	311	pg/g	2.1		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.42		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	752	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1420	pg/g	0.0956	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	31.3	pg/g	0.382		

SLC
10-8-01

Sample Results

Sample FS-08-SB-T

Fish: Black Sea Bass

Lab ID L3606-21

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.01	pg/g	0.225		
Total Dichlorobiphenyls	8.86	pg/g	0.442		
Total Trichlorobiphenyls	75.5	pg/g	0.315		
Total Tetrachlorobiphenyls	3120	pg/g	2.15		
Total Pentachlorobiphenyls	22400	pg/g	2.55		
Total Hexachlorobiphenyls	20600	pg/g	3.22		
Total Heptachlorobiphenyls	4190	pg/g	0.382		
Total Octachlorobiphenyls	859	pg/g	0.217		
Total Nonachlorobiphenyls	221	pg/g	0.135		
209 - Decachlorobiphenyl	29.1	pg/g	0.052		
Total Polychlorinated Biphenyls	51500	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-SB-T Fish: Black Sea Bass

Lab ID L3606-21 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	2.29	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	6.66	pg/g	0.228	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	13.2	pg/g	0.239	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	278	pg/g	0.238	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	233	pg/g	0.223	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	999	pg/g	0.247		
66 - 2,3',4,4'-Tetrachlorobiphenyl	368	pg/g	1.79		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.75	pg/g	2.15		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1880	pg/g	0.45	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	4270	pg/g	0.452	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2060	pg/g	2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	5530	pg/g	2		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.55		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1210	pg/g	2.69	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	6420	pg/g	2.61	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6040	pg/g	2.29	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	937	pg/g	6.81		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.42		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	752	pg/g	0.121	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1420	pg/g	0.0956	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	426	pg/g	0.103	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.01	pg/g	0.0695		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	715	pg/g	0.095		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	57.7	pg/g	0.217		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	151	pg/g	0.135		
209 - Decachlorobiphenyl	29.1	pg/g	0.052		

SLC
10-8-01

Sample Results

Sample FS-09-SB-T

Fish: Black Sea Bass

Lab ID L3606-31

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.17	pg/g	3.9		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	617	pg/g	8.42		
114 - 2,3,4,4',5-Pentachlorobiphenyl	39.7	pg/g	8.39		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1790	pg/g	7.94		
123 - 2',3,4,4',5-Pentachlorobiphenyl	20.2	pg/g	9.11		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.7	pg/g	2		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	200	pg/g	4.87		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	45.6	pg/g	4.9		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	72.5	pg/g	1.29		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.52		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	204	pg/g	0.068	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	451	pg/g	0.052	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	7.8	pg/g	0.222		

SLC
10-8-01

Sample Results

Sample FS-09-SB-T

Fish: Black Sea Bass

Lab ID L3606-31

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	3.54	pg/g	0.134		
Total Dichlorobiphenyls	51.5	pg/g	0.326		
Total Trichlorobiphenyls	368	pg/g	0.281		
Total Tetrachlorobiphenyls	2430	pg/g	3.9		
Total Pentachlorobiphenyls	7390	pg/g	10.4		
Total Hexachlorobiphenyls	6070	pg/g	2.03		
Total Heptachlorobiphenyls	1650	pg/g	0.222		
Total Octachlorobiphenyls	525	pg/g	0.235		
Total Nonachlorobiphenyls	169	pg/g	0.106		
209 - Decachlorobiphenyl	30.3	pg/g	0.0683		
Total Polychlorinated Biphenyls	18700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-09-SB-T

Fish: Black Sea Bass

Lab ID L3606-31

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	6.62	pg/g	0.226		
18 - 2,2',5-Trichlorobiphenyl	66.7	pg/g	0.151	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	28.9	pg/g	0.233	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	270	pg/g	0.0782	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	203	pg/g	0.072	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	818	pg/g	0.0836		
66 - 2,3',4,4'-Tetrachlorobiphenyl	215	pg/g	3.25		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.17	pg/g	3.9		
87 - 2,2',3,4,5-Pentachlorobiphenyl	588	pg/g	0.518	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1190	pg/g	0.521	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	617	pg/g	8.42		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1790	pg/g	7.94		
126 - 3,3',4,4',5-Pentachlorobiphenyl	4.7	pg/g	2		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	289	pg/g	1.63	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1690	pg/g	1.58	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2000	pg/g	1.38	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	200	pg/g	4.87		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.52		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	204	pg/g	0.068	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	451	pg/g	0.052	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	155	pg/g	0.0574	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.24	pg/g	0.0381		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	456	pg/g	0.0529		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	19.4	pg/g	0.235		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	108	pg/g	0.106		
209 - Decachlorobiphenyl	30.3	pg/g	0.0683		

SLC
10-8-01

Sample Results

Sample FS-10-SB-T

Fish: Black Sea Bass

Lab ID L3606-36R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.68	pg/g	2.02		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	826	pg/g	1.41		
114 - 2,3,4,4',5-Pentachlorobiphenyl	49.3	pg/g	1.35		
118 - 2,3',4,4',5-Pentachlorobiphenyl	2460	pg/g	1.24		
123 - 2',3,4,4',5-Pentachlorobiphenyl	34.3	pg/g	1.41		
126 - 3,3',4,4',5-Pentachlorobiphenyl	5.64	pg/g	1.69	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	293	pg/g	4.21		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	77.4	pg/g	4.26		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	115	pg/g	1.17		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.43		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	302	pg/g	0.312	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	654	pg/g	0.243	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	13.1	pg/g	0.367		

SLC
10-8-01

Sample Results

Sample FS-10-SB-T

Fish: Black Sea Bass

Lab ID L3606-36R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.82	pg/g	0.105		
Total Dichlorobiphenyls	16.6	pg/g	0.257		
Total Trichlorobiphenyls	156	pg/g	0.193		
Total Tetrachlorobiphenyls	2150	pg/g	2.02		
Total Pentachlorobiphenyls	9570	pg/g	1.69		
Total Hexachlorobiphenyls	9090	pg/g	2.12		
Total Heptachlorobiphenyls	2340	pg/g	0.367		
Total Octachlorobiphenyls	638	pg/g	0.459		
Total Nonachlorobiphenyls	162	pg/g	0.341		
209 - Decachlorobiphenyl	20.8	pg/g	0.401		
Total Polychlorinated Biphenyls	24100	pg/g			

SLC
10-8-01

Sample Results

Sample FS-10-SB-T

Fish: Black Sea Bass

Lab ID L3606-36R

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.94	pg/g	0.18		
18 - 2,2',5-Trichlorobiphenyl	14.5	pg/g	0.111	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	41.3	pg/g	0.162	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	237	pg/g	0.0784	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	186	pg/g	0.0742	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	695	pg/g	0.084		
66 - 2,3',4,4'-Tetrachlorobiphenyl	251	pg/g	1.66		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.68	pg/g	2.02		
87 - 2,2',3,4,5-Pentachlorobiphenyl	728	pg/g	0.733	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1730	pg/g	0.735	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	826	pg/g	1.41		
118 - 2,3',4,4',5-Pentachlorobiphenyl	2460	pg/g	1.24		
126 - 3,3',4,4',5-Pentachlorobiphenyl	5.64	pg/g	1.69	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	419	pg/g	1.68	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2620	pg/g	1.6	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2970	pg/g	1.42	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	293	pg/g	4.21		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.43		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	302	pg/g	0.312	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	654	pg/g	0.243	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	225	pg/g	0.268	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.67	pg/g	0.185		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	639	pg/g	0.255		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	24.9	pg/g	0.459		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	104	pg/g	0.341		
209 - Decachlorobiphenyl	20.8	pg/g	0.401		

SLC
10-8-01

Sample Results

Sample FS-11-SB-T

Fish: Black Sea Bass

Lab ID L3606-43R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.68	pg/g	2.61		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1410	pg/g	23.2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	79.4	pg/g	22.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3710	pg/g	21		
123 - 2',3,4,4',5-Pentachlorobiphenyl	53.6	pg/g	24.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	10		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	510	pg/g	8.63		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	139	pg/g	8.87		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	212	pg/g	3.44		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.13		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	646	pg/g	1.19	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1440	pg/g	0.964	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	21.8	pg/g	0.686		

SLC
10-8-01

Sample Results

Sample FS-11-SB-T

Fish: Black Sea Bass

Lab ID L3606-43R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.41	pg/g	0.211		
Total Dichlorobiphenyls	26.9	pg/g	0.375		
Total Trichlorobiphenyls	224	pg/g	0.577		
Total Tetrachlorobiphenyls	2470	pg/g	2.61		
Total Pentachlorobiphenyls	12100	pg/g	29.1		
Total Hexachlorobiphenyls	16600	pg/g	5.99		
Total Heptachlorobiphenyls	4990	pg/g	1.22		
Total Octachlorobiphenyls	1360	pg/g	0.901		
Total Nonachlorobiphenyls	343	pg/g	0.644		
209 - Decachlorobiphenyl	69.8	pg/g	0.765		
Total Polychlorinated Biphenyls	38200	pg/g			

SLC
10-8-01

Sample Results

Sample FS-11-SB-T Fish: Black Sea Bass

Lab ID L3606-43R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.7	pg/g	0.242		
18 - 2,2',5-Trichlorobiphenyl	34.5	pg/g	0.157	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	29.8	pg/g	0.447	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	261	pg/g	0.497	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	184	pg/g	0.46	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	787	pg/g	0.537		
66 - 2,3',4,4'-Tetrachlorobiphenyl	341	pg/g	2.35		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.68	pg/g	2.61		
87 - 2,2',3,4,5-Pentachlorobiphenyl	724	pg/g	1.52	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2140	pg/g	1.54	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1410	pg/g	23.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3710	pg/g	21		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	10		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	829	pg/g	4.54	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4390	pg/g	4.51	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6580	pg/g	4.23	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	510	pg/g	8.63		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.13		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	646	pg/g	1.19	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1440	pg/g	0.964	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	525	pg/g	1.09	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.59	pg/g	0.779		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1390	pg/g	0.984		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	49.8	pg/g	0.901		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	209	pg/g	0.644		
209 - Decachlorobiphenyl	69.8	pg/g	0.765		

SLC
10-8-01

Sample Results

Sample FS-03-VS-R

Fish: Vermilion Snapper

Lab ID L3606-35

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.83	pg/g	1.72		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	148	pg/g	2.13		
114 - 2,3,4,4',5-Pentachlorobiphenyl	9.4	pg/g	2.12		
118 - 2,3',4,4',5-Pentachlorobiphenyl	409	pg/g	2.03		
123 - 2',3,4,4',5-Pentachlorobiphenyl	7.51	pg/g	2.18		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.78	pg/g	2.46	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	74.3	pg/g	1.89		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	22	pg/g	1.75		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	34.2	pg/g	0.653		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.77		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	115	pg/g	0.0706	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	297	pg/g	0.054	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.72	pg/g	0.159		

SLC
10-8-01

Sample Results

Sample FS-03-VS-R

Fish: Vermilion Snapper

Lab ID L3606-35

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.09	pg/g	0.0996		
Total Dichlorobiphenyls	15.1	pg/g	0.23		
Total Trichlorobiphenyls	76	pg/g	0.123		
Total Tetrachlorobiphenyls	353	pg/g	1.74		
Total Pentachlorobiphenyls	1820	pg/g	2.46		
Total Hexachlorobiphenyls	2810	pg/g	1.03		
Total Heptachlorobiphenyls	1060	pg/g	0.159		
Total Octachlorobiphenyls	360	pg/g	0.104		
Total Nonachlorobiphenyls	115	pg/g	0.0974		
209 - Decachlorobiphenyl	10.7	pg/g	0.0446		
Total Polychlorinated Biphenyls	6620	pg/g			

SLC
10-8-01

Sample Results

Sample FS-03-VS-R Fish: Vermilion Snapper

Lab ID L3606-35 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.18	pg/g	0.155		
18 - 2,2',5-Trichlorobiphenyl	7.59	pg/g	0.0872	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	21	pg/g	0.0863	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	37.2	pg/g	0.0472	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	29.8	pg/g	0.0435	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	67.1	pg/g	0.0505		
66 - 2,3',4,4'-Tetrachlorobiphenyl	45.8	pg/g	1.57		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.83	pg/g	1.72		
87 - 2,2',3,4,5-Pentachlorobiphenyl	142	pg/g	0.233	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	328	pg/g	0.234	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	148	pg/g	2.13		
118 - 2,3',4,4',5-Pentachlorobiphenyl	409	pg/g	2.03		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.78	pg/g	2.46	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	118	pg/g	0.833	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	763	pg/g	0.804	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	951	pg/g	0.705	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	74.3	pg/g	1.89		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.77		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	115	pg/g	0.0706	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	297	pg/g	0.054	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	103	pg/g	0.0596	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.24	pg/g	0.0396		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	298	pg/g	0.0549		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	10.7	pg/g	0.104		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	75	pg/g	0.0974		
209 - Decachlorobiphenyl	10.7	pg/g	0.0446		

SLC
10-8-01

Sample Results

Sample FS-04-VS-R

Fish: Vermilion Snapper

Lab ID L3606-19

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.72	pg/g	0.968		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	130	pg/g	1.85		
114 - 2,3,4,4',5-Pentachlorobiphenyl	7.27	pg/g	1.82		
118 - 2,3',4,4',5-Pentachlorobiphenyl	368	pg/g	1.73		
123 - 2',3,4,4',5-Pentachlorobiphenyl	5.95	pg/g	1.87		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.9	pg/g	2.14	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.9	pg/g	1.91		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	21.1	pg/g	1.75		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	33	pg/g	0.758		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.838		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	110	pg/g	0.0606	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	318	pg/g	0.048	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6	pg/g	0.144		

SLC
10-8-01

Sample Results

Sample FS-04-VS-R

Fish: Vermilion Snapper

Lab ID L3606-19

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	ND	pg/g	0.822	U	MB-I
Total Dichlorobiphenyls	12.4	pg/g	0.166		
Total Trichlorobiphenyls	60.6	pg/g	0.109		
Total Tetrachlorobiphenyls	280	pg/g	0.968		
Total Pentachlorobiphenyls	1570	pg/g	2.14		
Total Hexachlorobiphenyls	2700	pg/g	1.16		
Total Heptachlorobiphenyls	1070	pg/g	0.144		
Total Octachlorobiphenyls	416	pg/g	0.0794		
Total Nonachlorobiphenyls	181	pg/g	0.0989		
209 - Decachlorobiphenyl	21.6	pg/g	0.049		
Total Polychlorinated Biphenyls	6310	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-VS-R

Fish: Vermilion Snapper

Lab ID L3606-19

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.66	pg/g	0.112		
18 - 2,2',5-Trichlorobiphenyl	6.58	pg/g	0.0787	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	18.4	pg/g	0.0904	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	30.8	pg/g	0.0336	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	24.9	pg/g	0.0315	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	50.8	pg/g	0.0349		
66 - 2,3',4,4'-Tetrachlorobiphenyl	38.6	pg/g	0.813		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.72	pg/g	0.968		
87 - 2,2',3,4,5-Pentachlorobiphenyl	113	pg/g	0.182	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	272	pg/g	0.183	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	130	pg/g	1.85		
118 - 2,3',4,4',5-Pentachlorobiphenyl	368	pg/g	1.73		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.9	pg/g	2.14	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	107	pg/g	0.967	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	752	pg/g	0.938	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	959	pg/g	0.824	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	71.9	pg/g	1.91		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.838		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	110	pg/g	0.0606	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	318	pg/g	0.048	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	107	pg/g	0.0515	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.91	pg/g	0.0349		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	306	pg/g	0.0477		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	13	pg/g	0.0794		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	127	pg/g	0.0989		
209 - Decachlorobiphenyl	21.6	pg/g	0.049		

SLC
10-8-01

Sample Results

Sample FS-06-VS-R

Fish: Vermilion Snapper

Lab ID L3606-15

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.36	pg/g	0.891		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	147	pg/g	1.5		
114 - 2,3,4,4',5-Pentachlorobiphenyl	8.01	pg/g	1.51		
118 - 2,3',4,4',5-Pentachlorobiphenyl	401	pg/g	1.46		
123 - 2',3,4,4',5-Pentachlorobiphenyl	7.55	pg/g	1.56		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.08	pg/g	1.73	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	75.4	pg/g	1.02		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	21.2	pg/g	0.974		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	32.8	pg/g	0.647		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.751		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	116	pg/g	0.14	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	301	pg/g	0.107	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	5.5	pg/g	0.18		

SLC
10-8-01

Sample Results

Sample FS-06-VS-R

Fish: Vermilion Snapper

Lab ID L3606-15

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.44	pg/g	0.0836		
Total Dichlorobiphenyls	17.7	pg/g	0.126		
Total Trichlorobiphenyls	89.2	pg/g	0.0955		
Total Tetrachlorobiphenyls	374	pg/g	0.891		
Total Pentachlorobiphenyls	1890	pg/g	1.73		
Total Hexachlorobiphenyls	2740	pg/g	1.07		
Total Heptachlorobiphenyls	1090	pg/g	0.18		
Total Octachlorobiphenyls	338	pg/g	0.115		
Total Nonachlorobiphenyls	105	pg/g	0.173		
209 - Decachlorobiphenyl	9.75	pg/g	0.103		
Total Polychlorinated Biphenyls	6660	pg/g			

SLC
10-8-01

Sample Results

Sample FS-06-VS-R

Fish: Vermilion Snapper

Lab ID L3606-15

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.9	pg/g	0.0939		
18 - 2,2',5-Trichlorobiphenyl	9.72	pg/g	0.0677	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	24.5	pg/g	0.066	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	39.4	pg/g	0.082	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	33.6	pg/g	0.0768	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	75.3	pg/g	0.0844		
66 - 2,3',4,4'-Tetrachlorobiphenyl	44.2	pg/g	0.756		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.36	pg/g	0.891		
87 - 2,2',3,4,5-Pentachlorobiphenyl	148	pg/g	0.173	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	349	pg/g	0.173	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	147	pg/g	1.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	401	pg/g	1.46		
126 - 3,3',4,4',5-Pentachlorobiphenyl	3.08	pg/g	1.73	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	109	pg/g	0.859	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	751	pg/g	0.83	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	905	pg/g	0.715	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	75.4	pg/g	1.02		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.751		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	116	pg/g	0.14	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	301	pg/g	0.107	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	102	pg/g	0.116	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.48	pg/g	0.0792		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	296	pg/g	0.11		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.91	pg/g	0.115		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	69.3	pg/g	0.173		
209 - Decachlorobiphenyl	9.75	pg/g	0.103		

SLC
10-8-01

Sample Results

Sample FS-08-VS-R

Fish: Vermilion Snapper

Lab ID L3606-9 i

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.46	pg/g	1.25		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	108	pg/g	0.908		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.46	pg/g	0.862		
118 - 2,3',4,4',5-Pentachlorobiphenyl	265	pg/g	0.841		
123 - 2',3,4,4',5-Pentachlorobiphenyl	5.69	pg/g	0.901		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.42	pg/g	1.09	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.6	pg/g	0.389		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	14.2	pg/g	0.376		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	20	pg/g	0.423		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.526		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	62.2	pg/g	0.12	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	146	pg/g	0.092	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.2	pg/g	0.103		

SLC
10-8-01

Sample Results

Sample FS-08-VS-R

Fish: Vermilion Snapper

Lab ID L3606-9 i

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.14	pg/g	0.109		
Total Dichlorobiphenyls	15.2	pg/g	0.191		
Total Trichlorobiphenyls	91.5	pg/g	0.11		
Total Tetrachlorobiphenyls	349	pg/g	1.25		
Total Pentachlorobiphenyls	1400	pg/g	1.09		
Total Hexachlorobiphenyls	1730	pg/g	0.708		
Total Heptachlorobiphenyls	632	pg/g	0.12		
Total Octachlorobiphenyls	216	pg/g	0.0931		
Total Nonachlorobiphenyls	64.8	pg/g	0.102		
209 - Decachlorobiphenyl	5.86	pg/g	0.0712		
Total Polychlorinated Biphenyls	4510	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-VS-R

Fish: Vermilion Snapper

Lab ID L3606-9 i

Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.31	pg/g	0.141		
18 - 2,2',5-Trichlorobiphenyl	8.44	pg/g	0.0778	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	27.3	pg/g	0.0941	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	39.1	pg/g	0.0501	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	30.5	pg/g	0.0469	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	69	pg/g	0.0515		
66 - 2,3',4,4'-Tetrachlorobiphenyl	41.5	pg/g	1.06		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.46	pg/g	1.25		
87 - 2,2',3,4,5-Pentachlorobiphenyl	121	pg/g	0.122	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	254	pg/g	0.122	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	108	pg/g	0.908		
118 - 2,3',4,4',5-Pentachlorobiphenyl	265	pg/g	0.841		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.42	pg/g	1.09	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	68.1	pg/g	0.57	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	464	pg/g	0.55	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	502	pg/g	0.474	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	45.6	pg/g	0.389		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.526		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	62.2	pg/g	0.12	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	146	pg/g	0.092	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	53.9	pg/g	0.0997	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.15	pg/g	0.068		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	177	pg/g	0.0941		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.19	pg/g	0.0931		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	38.9	pg/g	0.102		
209 - Decachlorobiphenyl	5.86	pg/g	0.0712		

SLC
10-8-01

Sample Results

Sample FS-12-VS-R

Fish: Vermilion Snapper

Lab ID L3606-30

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.68	pg/g	1.81		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	266	pg/g	4.1		
114 - 2,3,4,4',5-Pentachlorobiphenyl	17	pg/g	4.17		
118 - 2,3',4,4',5-Pentachlorobiphenyl	862	pg/g	3.94		
123 - 2',3,4,4',5-Pentachlorobiphenyl	13.2	pg/g	4.26		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.88		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	162	pg/g	3.52		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	45.4	pg/g	3.5		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	78.1	pg/g	1.11		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.29		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	261	pg/g	0.111	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	688	pg/g	0.0847	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	10.9	pg/g	0.238		

SLC 10-8-01

Sample Results

Sample FS-12-VS-R

Fish: Vermilion Snapper

Lab ID L3606-30

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	3.5	pg/g	0.109		
Total Dichlorobiphenyls	24.5	pg/g	0.285		
Total Trichlorobiphenyls	97	pg/g	0.145		
Total Tetrachlorobiphenyls	452	pg/g	1.81		
Total Pentachlorobiphenyls	3240	pg/g	4.88		
Total Hexachlorobiphenyls	5870	pg/g	1.77		
Total Heptachlorobiphenyls	2130	pg/g	0.238		
Total Octachlorobiphenyls	665	pg/g	0.233		
Total Nonachlorobiphenyls	220	pg/g	0.164		
209 - Decachlorobiphenyl	27.5	pg/g	0.0559		
Total Polychlorinated Biphenyls	12700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-12-VS-R Fish: Vermilion Snapper

Lab ID L3606-30 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.34	pg/g	0.194		
18 - 2,2',5-Trichlorobiphenyl	4.74	pg/g	0.103	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	32.1	pg/g	0.107	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	49.1	pg/g	0.0857	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	40.4	pg/g	0.0789	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	81.2	pg/g	0.0915		
66 - 2,3',4,4'-Tetrachlorobiphenyl	76.4	pg/g	1.58		
77 - 3,3',4,4'-Tetrachlorobiphenyl	6.68	pg/g	1.81		
87 - 2,2',3,4,5-Pentachlorobiphenyl	207	pg/g	0.175	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	560	pg/g	0.176	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	266	pg/g	4.1		
118 - 2,3',4,4',5-Pentachlorobiphenyl	862	pg/g	3.94		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.88		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	243	pg/g	1.43	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1590	pg/g	1.38	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2220	pg/g	1.21	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	162	pg/g	3.52		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.29		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	261	pg/g	0.111	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	688	pg/g	0.0847	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	229	pg/g	0.0936	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	6.08	pg/g	0.0621		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	537	pg/g	0.0861		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	23.8	pg/g	0.233		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	151	pg/g	0.164		
209 - Decachlorobiphenyl	27.5	pg/g	0.0559		

SLC
10-8-01

Sample Results

Sample FS-19-VS-R

Fish: Vermilion Snapper

Lab ID L3606-18

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.54	pg/g	2.38		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	232	pg/g	3.41		
114 - 2,3,4,4',5-Pentachlorobiphenyl	13.3	pg/g	3.32		
118 - 2,3',4,4',5-Pentachlorobiphenyl	682	pg/g	3.14		
123 - 2',3,4,4',5-Pentachlorobiphenyl	10.6	pg/g	3.37		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.06		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	116	pg/g	3.15		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	32.3	pg/g	2.88		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	52.6	pg/g	0.977		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.17		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	158	pg/g	0.0551	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	421	pg/g	0.0437	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	7.84	pg/g	0.23		

SLC
10-8-01

Sample Results

Sample FS-19-VS-R

Fish: Vermilion Snapper

Lab ID L3606-18

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.952	pg/g	0.0832		
Total Dichlorobiphenyls	20.6	pg/g	0.182		
Total Trichlorobiphenyls	104	pg/g	0.127		
Total Tetrachlorobiphenyls	504	pg/g	2.38		
Total Pentachlorobiphenyls	2900	pg/g	4.06		
Total Hexachlorobiphenyls	4530	pg/g	1.53		
Total Heptachlorobiphenyls	1500	pg/g	0.23		
Total Octachlorobiphenyls	508	pg/g	0.137		
Total Nonachlorobiphenyls	157	pg/g	0.145		
209 - Decachlorobiphenyl	17.7	pg/g	0.0526		
Total Polychlorinated Biphenyls	10200	pg/g			

SLC
10-8-01

Sample Results

Sample FS-19-VS-R Fish: Vermilion Snapper

Lab ID L3606-18 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	6.01	pg/g	0.128		
18 - 2,2',5-Trichlorobiphenyl	11.5	pg/g	0.092	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	27.3	pg/g	0.0958	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	49.4	pg/g	0.0343	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	46.1	pg/g	0.0321	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	93.9	pg/g	0.0356		
66 - 2,3',4,4'-Tetrachlorobiphenyl	66.4	pg/g	1.91		
77 - 3,3',4,4'-Tetrachlorobiphenyl	8.54	pg/g	2.38		
87 - 2,2',3,4,5-Pentachlorobiphenyl	211	pg/g	0.131	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	527	pg/g	0.132	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	232	pg/g	3.41		
118 - 2,3',4,4',5-Pentachlorobiphenyl	682	pg/g	3.14		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	4.06		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	179	pg/g	1.28	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1240	pg/g	1.24	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1580	pg/g	1.09	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	116	pg/g	3.15		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.17		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	158	pg/g	0.0551	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	421	pg/g	0.0437	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	151	pg/g	0.0469	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	4.39	pg/g	0.0318		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	419	pg/g	0.0434		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	17.1	pg/g	0.137		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	102	pg/g	0.145		
209 - Decachlorobiphenyl	17.7	pg/g	0.0526		

SLC
10-8-01

Sample Results

Sample FS-20-VS-R

Fish: Vermilion Snapper

Lab ID L3606-40R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.48	pg/g	2.31		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	149	pg/g	4.13		
114 - 2,3,4,4',5-Pentachlorobiphenyl	7.2	pg/g	3.87		
118 - 2,3',4,4',5-Pentachlorobiphenyl	403	pg/g	4.03		
123 - 2',3,4,4',5-Pentachlorobiphenyl	8.29	pg/g	4.07		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.13		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.7	pg/g	3.44		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	24.4	pg/g	3.38		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	39.3	pg/g	1.36		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.66		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	136	pg/g	1.89	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	356	pg/g	1.52	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.17	pg/g	0.524		

SLC
10-8-01

Sample Results

Sample FS-20-VS-R

Fish: Vermilion Snapper

Lab ID L3606-40R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.802	pg/g	0.128		
Total Dichlorobiphenyls	5.19	pg/g	0.212		
Total Trichlorobiphenyls	43.3	pg/g	0.19		
Total Tetrachlorobiphenyls	290	pg/g	2.31		
Total Pentachlorobiphenyls	1710	pg/g	5.13		
Total Hexachlorobiphenyls	3070	pg/g	2.5		
Total Heptachlorobiphenyls	1040	pg/g	1.93		
Total Octachlorobiphenyls	336	pg/g	1.9		
Total Nonachlorobiphenyls	112	pg/g	0.581		
209 - Decachlorobiphenyl	13	pg/g	0.675		
Total Polychlorinated Biphenyls	6620	pg/g			

SLC 10-8-01

Sample Results

Sample FS-20-VS-R Fish: Vermilion Snapper

Lab ID L3606-40R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.52	pg/g	0.146		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	2.28	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	16.6	pg/g	0.128	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	28.1	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	25.7	pg/g	0.129	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	64	pg/g	0.151		
66 - 2,3',4,4'-Tetrachlorobiphenyl	43.1	pg/g	2.19		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.48	pg/g	2.31		
87 - 2,2',3,4,5-Pentachlorobiphenyl	126	pg/g	0.375	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	319	pg/g	0.38	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	149	pg/g	4.13		
118 - 2,3',4,4',5-Pentachlorobiphenyl	403	pg/g	4.03		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.13		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	119	pg/g	1.9	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	818	pg/g	1.88	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1160	pg/g	1.77	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	85.7	pg/g	3.44		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.66		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	136	pg/g	1.89	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	356	pg/g	1.52	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	119	pg/g	1.72	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.62	pg/g	1.23		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	217	pg/g	1.55		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	12	pg/g	0.337		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	80.8	pg/g	0.581		
209 - Decachlorobiphenyl	13	pg/g	0.675		

SLC
10-8-01

Sample Results

Sample FS-05-VS-T

Fish: Vermilion Snapper

Lab ID L3606-38R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	13	pg/g	6.53		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1290	pg/g	18.2		
114 - 2,3,4,4',5-Pentachlorobiphenyl	82.1	pg/g	19.7		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3890	pg/g	16.6		
123 - 2',3,4,4',5-Pentachlorobiphenyl	56.1	pg/g	19.8		
126 - 3,3',4,4',5-Pentachlorobiphenyl	10.8	pg/g	8		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	557	pg/g	8.76		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	129	pg/g	8.84		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	229	pg/g	3.54		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	751	pg/g	1.4	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2460	pg/g	1.13	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	25.9	pg/g	0.597		

SLC 10-8-01

Sample Results

Sample FS-05-VS-T

Fish: Vermilion Snapper

Lab ID L3606-38R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.26	pg/g	0.254		
Total Dichlorobiphenyls	14.6	pg/g	0.386		
Total Trichlorobiphenyls	173	pg/g	0.404		
Total Tetrachlorobiphenyls	3030	pg/g	6.53		
Total Pentachlorobiphenyls	16500	pg/g	24.3		
Total Hexachlorobiphenyls	20000	pg/g	6.32		
Total Heptachlorobiphenyls	7370	pg/g	1.43		
Total Octachlorobiphenyls	2170	pg/g	0.659		
Total Nonachlorobiphenyls	419	pg/g	0.297		
209 - Decachlorobiphenyl	34.2	pg/g	0.261		
Total Polychlorinated Biphenyls	49700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-VS-T

Fish: Vermilion Snapper

Lab ID L3606-38R

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.08	pg/g	0.277		
18 - 2,2',5-Trichlorobiphenyl	20.2	pg/g	0.298	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	42	pg/g	0.202	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	255	pg/g	0.122	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	280	pg/g	0.113	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	942	pg/g	0.131		
66 - 2,3',4,4'-Tetrachlorobiphenyl	335	pg/g	6.2		
77 - 3,3',4,4'-Tetrachlorobiphenyl	13	pg/g	6.53		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1330	pg/g	1.59	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	3060	pg/g	1.61	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1290	pg/g	18.2		
118 - 2,3',4,4',5-Pentachlorobiphenyl	3890	pg/g	16.6		
126 - 3,3',4,4',5-Pentachlorobiphenyl	10.8	pg/g	8		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	824	pg/g	4.79	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5430	pg/g	4.76	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	7150	pg/g	4.46	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	557	pg/g	8.76		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.3		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	751	pg/g	1.4	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2460	pg/g	1.13	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	633	pg/g	1.28	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	8.22	pg/g	0.914		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2030	pg/g	1.15		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	91.1	pg/g	0.659		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	283	pg/g	0.297		
209 - Decachlorobiphenyl	34.2	pg/g	0.261		

SLC
10-8-01

Sample Results

Sample FS-08-VS-T

Fish: Vermilion Snapper

Lab ID L3606-29

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	5.01	U	ID(IR)-I
105 - 2,3,3',4,4'-Pentachlorobiphenyl	371	pg/g	4.64		
114 - 2,3,4,4',5-Pentachlorobiphenyl	22.3	pg/g	4.56		
118 - 2,3',4,4',5-Pentachlorobiphenyl	972	pg/g	4.39		
123 - 2',3,4,4',5-Pentachlorobiphenyl	12.4	pg/g	4.82		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.59		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	111	pg/g	2.21		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	26.7	pg/g	2.24		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	41.5	pg/g	0.984		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.05		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	106	pg/g	0.117	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	246	pg/g	0.0891	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.4	pg/g	0.165		

SLC
10-8-01

Sample Results

Sample FS-08-VS-T

Fish: Vermilion Snapper

Lab ID L3606-29

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	2.69	pg/g	0.136		
Total Dichlorobiphenyls	25.4	pg/g	0.335		
Total Trichlorobiphenyls	212	pg/g	0.21		
Total Tetrachlorobiphenyls	1550	pg/g	3.79		
Total Pentachlorobiphenyls	5410	pg/g	5.59		
Total Hexachlorobiphenyls	3870	pg/g	1.52		
Total Heptachlorobiphenyls	993	pg/g	0.165		
Total Octachlorobiphenyls	291	pg/g	0.146		
Total Nonachlorobiphenyls	69.2	pg/g	0.111		
209 - Decachlorobiphenyl	5.75	pg/g	0.0446		
Total Polychlorinated Biphenyls	12400	pg/g			

SLC
10-8-01

Sample Results

Sample FS-08-VS-T Fish: Vermilion Snapper

Lab ID L3606-29 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	7.07	pg/g	0.217		
18 - 2,2',5-Trichlorobiphenyl	33.2	pg/g	0.105	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	37.4	pg/g	0.19	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	153	pg/g	0.105	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	134	pg/g	0.0966	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	456	pg/g	0.112		
66 - 2,3',4,4'-Tetrachlorobiphenyl	140	pg/g	3.43		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	5.01	U	ID(IR)-I
87 - 2,2',3,4,5-Pentachlorobiphenyl	514	pg/g	0.155	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	938	pg/g	0.156	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	371	pg/g	4.64		
118 - 2,3',4,4',5-Pentachlorobiphenyl	972	pg/g	4.39		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.59		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	180	pg/g	1.22	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1050	pg/g	1.18	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1040	pg/g	1.04	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	111	pg/g	2.21		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.05		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	106	pg/g	0.117	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	246	pg/g	0.0891	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	86.5	pg/g	0.0984	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.63	pg/g	0.0653		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	261	pg/g	0.0906		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	9.1	pg/g	0.146		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42.7	pg/g	0.111		
209 - Decachlorobiphenyl	5.75	pg/g	0.0446		

SLC
10-8-01

Sample Results

Sample FS-10-VS-T

Fish: Vermilion Snapper

Lab ID L3606-8

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.29	pg/g	1.93		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	493	pg/g	1.4		
114 - 2,3,4,4',5-Pentachlorobiphenyl	31.4	pg/g	1.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1360	pg/g	1.4		
123 - 2',3,4,4',5-Pentachlorobiphenyl	18.5	pg/g	1.4		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.92	pg/g	1.4	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	204	pg/g	0.692		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	44.2	pg/g	0.671		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	76.4	pg/g	0.748		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.846		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	173	pg/g	0.123	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	439	pg/g	0.0954	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	6.98	pg/g	0.179		

SLC
10-8-01

Sample Results

Sample FS-10-VS-T

Fish: Vermilion Snapper

Lab ID L3606-8

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.1	pg/g	0.0731		
Total Dichlorobiphenyls	19.5	pg/g	0.182		
Total Trichlorobiphenyls	173	pg/g	0.161		
Total Tetrachlorobiphenyls	1270	pg/g	1.93		
Total Pentachlorobiphenyls	5750	pg/g	1.4		
Total Hexachlorobiphenyls	5380	pg/g	1.18		
Total Heptachlorobiphenyls	1370	pg/g	0.179		
Total Octachlorobiphenyls	339	pg/g	0.0876		
Total Nonachlorobiphenyls	75.4	pg/g	0.1		
209 - Decachlorobiphenyl	5.76	pg/g	0.0899		
Total Polychlorinated Biphenyls	14400	pg/g			

SLC
10-8-01

Sample Results

Sample FS-10-VS-T

Fish: Vermilion Snapper

Lab ID L3606-8

Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.77	pg/g	0.135		
18 - 2,2',5-Trichlorobiphenyl	34	pg/g	0.0584	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	21.8	pg/g	0.141	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	116	pg/g	0.0502	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	122	pg/g	0.0469	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	390	pg/g	0.0511		
66 - 2,3',4,4'-Tetrachlorobiphenyl	111	pg/g	1.61		
77 - 3,3',4,4'-Tetrachlorobiphenyl	4.29	pg/g	1.93		
87 - 2,2',3,4,5-Pentachlorobiphenyl	446	pg/g	0.195	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1010	pg/g	0.196	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	493	pg/g	1.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	1360	pg/g	1.4		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.92	pg/g	1.4	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	238	pg/g	0.943	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1580	pg/g	0.936	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1730	pg/g	0.827	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	204	pg/g	0.692		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.846		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	173	pg/g	0.123	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	439	pg/g	0.0954	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	130	pg/g	0.106	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.23	pg/g	0.0747		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	315	pg/g	0.0994		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	15.1	pg/g	0.0701		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	48.7	pg/g	0.1		
209 - Decachlorobiphenyl	5.76	pg/g	0.0899		

SLC
10-8-01

Sample Results

Sample FS-14-VS-T

Fish: Vermilion Snapper

Lab ID L3606-52R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	5.68		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	328	pg/g	6.35		
114 - 2,3,4,4',5-Pentachlorobiphenyl	18.4	pg/g	6.55		
118 - 2,3',4,4',5-Pentachlorobiphenyl	858	pg/g	5.85		
123 - 2',3,4,4',5-Pentachlorobiphenyl	12.9	pg/g	6.49		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	8.23		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	101	pg/g	4.43		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	25.9	pg/g	4.26		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	41.2	pg/g	1.35		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.6		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	111	pg/g	0.0867	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	270	pg/g	0.0682	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.37	pg/g	0.211		

Sue 10-8-01

Sample Results

Sample FS-14-VS-T

Fish: Vermilion Snapper

Lab ID L3606-52R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.71	pg/g	0.057		
Total Dichlorobiphenyls	16	pg/g	0.115		
Total Trichlorobiphenyls	146	pg/g	0.163		
Total Tetrachlorobiphenyls	1290	pg/g	5.68		
Total Pentachlorobiphenyls	4280	pg/g	8.23		
Total Hexachlorobiphenyls	4090	pg/g	2.27		
Total Heptachlorobiphenyls	1010	pg/g	0.211		
Total Octachlorobiphenyls	281	pg/g	0.08		
Total Nonachlorobiphenyls	64.4	pg/g	0.0674		
209 - Decachlorobiphenyl	5.54	pg/g	0.032		
Total Polychlorinated Biphenyls	11200	pg/g			

SLC 10-8-01

Sample Results

Sample FS-14-VS-T Fish: Vermilion Snapper

Lab ID L3606-52R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.59	pg/g	0.0749		
18 - 2,2',5-Trichlorobiphenyl	21.8	pg/g	0.0574	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	28.3	pg/g	0.128	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	144	pg/g	0.0319	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	117	pg/g	0.0294	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	412	pg/g	0.0339		
66 - 2,3',4,4'-Tetrachlorobiphenyl	124	pg/g	4.97		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	5.68		
87 - 2,2',3,4,5-Pentachlorobiphenyl	431	pg/g	0.44	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	818	pg/g	0.445	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	328	pg/g	6.35		
118 - 2,3',4,4',5-Pentachlorobiphenyl	858	pg/g	5.85		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	8.23		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	182	pg/g	1.78	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1140	pg/g	1.77	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1150	pg/g	1.52	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	101	pg/g	4.43		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.6		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	111	pg/g	0.0867	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	270	pg/g	0.0682	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	95.2	pg/g	0.0762	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.3	pg/g	0.0506		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	264	pg/g	0.0697		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	8.4	pg/g	0.0683		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40.6	pg/g	0.0674		
209 - Decachlorobiphenyl	5.54	pg/g	0.032		

GLC 10-8-01

Sample Results

Sample FS-19-VS-T

Fish: Vermilion Snapper

Lab ID L3606-37R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.46	pg/g	1.71		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	294	pg/g	4.44		
114 - 2,3,4,4',5-Pentachlorobiphenyl	17	pg/g	4.32		
118 - 2,3',4,4',5-Pentachlorobiphenyl	814	pg/g	4.11		
123 - 2',3,4,4',5-Pentachlorobiphenyl	13.3	pg/g	4.54		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.37		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	94.2	pg/g	2.13		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	23.7	pg/g	2.1		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	36.1	pg/g	1.19		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.47		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	90.5	pg/g	0.293	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	231	pg/g	0.237	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.91	pg/g	0.241		

SLC 10-8-01

Sample Results

Sample FS-19-VS-T

Fish: Vermilion Snapper

Lab ID L3606-37R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.89	pg/g	0.168		
Total Dichlorobiphenyls	20.5	pg/g	0.246		
Total Trichlorobiphenyls	158	pg/g	0.236		
Total Tetrachlorobiphenyls	1210	pg/g	1.74		
Total Pentachlorobiphenyls	4270	pg/g	5.37		
Total Hexachlorobiphenyls	3620	pg/g	2.12		
Total Heptachlorobiphenyls	869	pg/g	0.3		
Total Octachlorobiphenyls	251	pg/g	0.351		
Total Nonachlorobiphenyls	67.5	pg/g	0.204		
209 - Decachlorobiphenyl	6.04	pg/g	0.224		
Total Polychlorinated Biphenyls	10500	pg/g			

SLC 10-8-01

Sample Results

Sample FS-19-VS-T Fish: Vermilion Snapper

Lab ID L3606-37R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	4.5	pg/g	0.163		
18 - 2,2',5-Trichlorobiphenyl	23	pg/g	0.156	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	30.2	pg/g	0.213	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	152	pg/g	0.18	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	99	pg/g	0.166	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	325	pg/g	0.194		
66 - 2,3',4,4'-Tetrachlorobiphenyl	122	pg/g	1.74		
77 - 3,3',4,4'-Tetrachlorobiphenyl	5.46	pg/g	1.71		
87 - 2,2',3,4,5-Pentachlorobiphenyl	391	pg/g	0.196	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	767	pg/g	0.199	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	294	pg/g	4.44		
118 - 2,3',4,4',5-Pentachlorobiphenyl	814	pg/g	4.11		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5.37		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	158	pg/g	1.61	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	988	pg/g	1.6	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	1050	pg/g	1.5	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	94.2	pg/g	2.13		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.47		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	90.5	pg/g	0.293	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	231	pg/g	0.237	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	81	pg/g	0.267	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	2.15	pg/g	0.191		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	230	pg/g	0.242		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.66	pg/g	0.216		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42	pg/g	0.204		
209 - Decachlorobiphenyl	6.04	pg/g	0.224		

SLC 10-8-01

Sample Results

Sample FS-04-WG-R

Fish: White Grunt

Lab ID L3606-25R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.675		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	79.1	pg/g	1.5		
114 - 2,3,4,4',5-Pentachlorobiphenyl	5.04	pg/g	1.51		
118 - 2,3',4,4',5-Pentachlorobiphenyl	235	pg/g	1.47		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.43	pg/g	1.51		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.85		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	36.5	pg/g	0.912		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	11.6	pg/g	0.813		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	17	pg/g	0.453		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.551		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	54.8	pg/g	0.0553	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	138	pg/g	0.0434	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.46	pg/g	0.0899		

SLC 10-8-01

Sample Results

Sample FS-04-WG-R

Fish: White Grunt

Lab ID L3606-25R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.07	pg/g	0.0599		
Total Dichlorobiphenyls	6.54	pg/g	0.164		
Total Trichlorobiphenyls	22.2	pg/g	0.0828		
Total Tetrachlorobiphenyls	86.4	pg/g	0.675		
Total Pentachlorobiphenyls	652	pg/g	1.85		
Total Hexachlorobiphenyls	1160	pg/g	0.751		
Total Heptachlorobiphenyls	402	pg/g	0.0899		
Total Octachlorobiphenyls	162	pg/g	0.0955		
Total Nonachlorobiphenyls	63.2	pg/g	0.0448		
209 - Decachlorobiphenyl	14.1	pg/g	0.0377		
Total Polychlorinated Biphenyls	2570	pg/g			

SLC
10-8-01

Sample Results

Sample FS-04-WG-R Fish: White Grunt

Lab ID L3606-25R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	ND	pg/g	2.19	U	MB-I
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.83	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	6.79	pg/g	0.0505	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	10.6	pg/g	0.028	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	6.63	pg/g	0.0258	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	14.8	pg/g	0.0298		
66 - 2,3',4,4'-Tetrachlorobiphenyl	18.3	pg/g	0.572		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.675		
87 - 2,2',3,4,5-Pentachlorobiphenyl	31.2	pg/g	0.0766	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	74.2	pg/g	0.0774	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	79.1	pg/g	1.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	235	pg/g	1.47		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	1.85		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	55.3	pg/g	0.588	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	362	pg/g	0.588	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	503	pg/g	0.502	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	36.5	pg/g	0.912		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.551		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	54.8	pg/g	0.0553	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	138	pg/g	0.0434	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	39.9	pg/g	0.0486	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.721	pg/g	0.0322		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	115	pg/g	0.0444		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	5.67	pg/g	0.0955		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	37.1	pg/g	0.0448		
209 - Decachlorobiphenyl	14.1	pg/g	0.0377		

SLC
10-8-01

Sample Results

Sample FS-05-WG-R Fish: White Grunt

Lab ID L3606-39R Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.821		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	77.6	pg/g	2.58		
114 - 2,3,4,4',5-Pentachlorobiphenyl	4.38	pg/g	2.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	235	pg/g	2.43		
123 - 2',3,4,4',5-Pentachlorobiphenyl	ND	pg/g	2.53		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.07		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	28.1	pg/g	1.46		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	10.5	pg/g	1.41		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	13.9	pg/g	0.237		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.291		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	55	pg/g	0.233	J	CRM-L
180 - 2,2';3,4,4',5,5'-Heptachlorobiphenyl	120	pg/g	0.181	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.72	pg/g	0.217		

SLC 10-8-01

Sample Results

Sample FS-05-WG-R

Fish: White Grunt

Lab ID L3606-39R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.718	pg/g	0.142		
Total Dichlorobiphenyls	5.36	pg/g	0.224		
Total Trichlorobiphenyls	20.5	pg/g	0.223		
Total Tetrachlorobiphenyls	71.5	pg/g	0.821		
Total Pentachlorobiphenyls	586	pg/g	3.07		
Total Hexachlorobiphenyls	1120	pg/g	0.372		
Total Heptachlorobiphenyls	345	pg/g	0.234		
Total Octachlorobiphenyls	130	pg/g	0.195		
Total Nonachlorobiphenyls	63.5	pg/g	0.245		
209 - Decachlorobiphenyl	14.1	pg/g	0.238		
Total Polychlorinated Biphenyls	2360	pg/g			

SLC
10-8-01

Sample Results

Sample FS-05-WG-R Fish: White Grunt

Lab ID L3606-39R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	1.48	pg/g	0.145		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	1.5	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	6.91	pg/g	0.159	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	8.5	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	4.98	pg/g	0.183	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	10.9	pg/g	0.219		
66 - 2,3',4,4'-Tetrachlorobiphenyl	15.4	pg/g	0.67		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.821		
87 - 2,2',3,4,5-Pentachlorobiphenyl	24.7	pg/g	0.158	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	53.7	pg/g	0.16	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	77.6	pg/g	2.58		
118 - 2,3',4,4',5-Pentachlorobiphenyl	235	pg/g	2.43		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	3.07		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	52.3	pg/g	0.293	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	331	pg/g	0.295	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	512	pg/g	0.259	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	28.1	pg/g	1.46		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.291		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	55	pg/g	0.233	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	120	pg/g	0.181	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	36.3	pg/g	0.199	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.728	pg/g	0.135		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	89.8	pg/g	0.183		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	4.6	pg/g	0.189		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	42.1	pg/g	0.245		
209 - Decachlorobiphenyl	14.1	pg/g	0.238		

SLC 10-8-01

Sample Results

Sample FS-07-WG-R

Fish: White Grunt

Lab ID L3606-1

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.87	pg/g	0.887		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1810	pg/g	0.8		
114 - 2,3,4,4',5-Pentachlorobiphenyl	113	pg/g	0.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4970	pg/g	0.8		
123 - 2',3,4,4',5-Pentachlorobiphenyl	56.4	pg/g	0.8		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.28	pg/g	0.8	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	669	pg/g	0.713		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	157	pg/g	0.736		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	231	pg/g	0.668		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.782		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	437	pg/g	0.129	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	801	pg/g	0.0998	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	20.4	pg/g	0.167		

SLC 10-8-01

Sample Results

Sample FS-07-WG-R

Fish: White Grunt

Lab ID L3606-1

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.78	pg/g	0.0787		
Total Dichlorobiphenyls	6.38	pg/g	0.427		
Total Trichlorobiphenyls	73.7	pg/g	0.131		
Total Tetrachlorobiphenyls	2390	pg/g	0.887		
Total Pentachlorobiphenyls	16700	pg/g	0.8		
Total Hexachlorobiphenyls	13800	pg/g	1.1		
Total Heptachlorobiphenyls	2240	pg/g	0.167		
Total Octachlorobiphenyls	371	pg/g	0.12		
Total Nonachlorobiphenyls	103	pg/g	0.138		
209 - Decachlorobiphenyl	16.3	pg/g	0.116		
Total Polychlorinated Biphenyls	35700	pg/g			

SLC
10-8-01

Sample Results

Sample FS-07-WG-R Fish: White Grunt

Lab ID L3606-1 Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.8	pg/g	0.299		
18 - 2,2',5-Trichlorobiphenyl	2.95	pg/g	0.0949	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	23	pg/g	0.101	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	144	pg/g	0.0905	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	155	pg/g	0.0846	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	446	pg/g	0.0923		
66 - 2,3',4,4'-Tetrachlorobiphenyl	378	pg/g	0.764		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.87	pg/g	0.887		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1170	pg/g	0.178	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2850	pg/g	0.18	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1810	pg/g	0.8		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4970	pg/g	0.8		
126 - 3,3',4,4',5-Pentachlorobiphenyl	2.28	pg/g	0.8	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	795	pg/g	0.879	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4710	pg/g	0.872	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	4170	pg/g	0.771	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	669	pg/g	0.713		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.782		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	437	pg/g	0.129	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	801	pg/g	0.0998	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	228	pg/g	0.111	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.944	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	319	pg/g	0.104		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	29.4	pg/g	0.12		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	68.9	pg/g	0.138		
209 - Decachlorobiphenyl	16.3	pg/g	0.116		

SLC 10-8-01

Sample Results

Sample FS-11-WG-R

Fish: White Grunt

Lab ID L3606-28R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.565		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	34	pg/g	0.583		
114 - 2,3,4,4',5-Pentachlorobiphenyl	1.96	pg/g	0.568		
118 - 2,3',4,4',5-Pentachlorobiphenyl	95.1	pg/g	0.55		
123 - 2',3,4,4',5-Pentachlorobiphenyl	1.49	pg/g	0.583		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.73		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	16.8	pg/g	0.977		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	4.95	pg/g	0.955		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	8.41	pg/g	0.333		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.462		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	40.7	pg/g	0.0911	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	112	pg/g	0.0716	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	2.12	pg/g	0.101		

SLC
10-8-01

Sample Results

Sample FS-11-WG-R

Fish: White Grunt

Lab ID L3606-28R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.839	pg/g	0.102		
Total Dichlorobiphenyls	8.02	pg/g	0.205		
Total Trichlorobiphenyls	22.2	pg/g	0.108		
Total Tetrachlorobiphenyls	67.5	pg/g	0.565		
Total Pentachlorobiphenyls	316	pg/g	0.73		
Total Hexachlorobiphenyls	670	pg/g	0.571		
Total Heptachlorobiphenyls	349	pg/g	0.101		
Total Octachlorobiphenyls	204	pg/g	0.13		
Total Nonachlorobiphenyls	116	pg/g	0.0612		
209 - Decachlorobiphenyl	28.3	pg/g	0.0545		
Total Polychlorinated Biphenyls	1780	pg/g			

SLC
10-8-01

Sample Results

Sample FS-11-WG-R Fish: White Grunt

Lab ID L3606-28R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.04	pg/g	0.138		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	2.55	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	6.61	pg/g	0.062	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	9.57	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	5.81	pg/g	0.0315	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	10.7	pg/g	0.0364		
66 - 2,3',4,4'-Tetrachlorobiphenyl	12.8	pg/g	0.489		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	0.565		
87 - 2,2',3,4,5-Pentachlorobiphenyl	17.8	pg/g	0.0668	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	47.5	pg/g	0.0675	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	34	pg/g	0.583		
118 - 2,3',4,4',5-Pentachlorobiphenyl	95.1	pg/g	0.55		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	0.73		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	29.4	pg/g	0.447	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	191	pg/g	0.447	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	300	pg/g	0.382	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	16.8	pg/g	0.977		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.462		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	40.7	pg/g	0.0911	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	112	pg/g	0.0716	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	33.7	pg/g	0.08	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.852	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	113	pg/g	0.0732		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	6.6	pg/g	0.0998		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	71.2	pg/g	0.0612		
209 - Decachlorobiphenyl	28.3	pg/g	0.0545		

SLC 10-8-01

Sample Results

Sample FS-15-WG-R

Fish: White Grunt

Lab ID L3606-51R

Location: Reference

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.74	pg/g	0.589		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	63.3	pg/g	2.29		
114 - 2,3,4,4',5-Pentachlorobiphenyl	2.95	pg/g	2.16		
118 - 2,3',4,4',5-Pentachlorobiphenyl	184	pg/g	2.1		
123 - 2',3,4,4',5-Pentachlorobiphenyl	2.2	pg/g	2.19		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.8		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	26.6	pg/g	0.824		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	8.86	pg/g	0.84		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	13.3	pg/g	0.355		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.443		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	38.4	pg/g	0.299	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	94.4	pg/g	0.235	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.92	pg/g	0.169		

SLC 10-8-01

Sample Results

Sample FS-15-WG-R

Fish: White Grunt

Lab ID L3606-51R

Location: Reference

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.528	pg/g	0.106		
Total Dichlorobiphenyls	12.8	pg/g	0.305		
Total Trichlorobiphenyls	53.3	pg/g	0.193		
Total Tetrachlorobiphenyls	111	pg/g	0.589		
Total Pentachlorobiphenyls	489	pg/g	2.8		
Total Hexachlorobiphenyls	851	pg/g	0.566		
Total Heptachlorobiphenyls	297	pg/g	0.3		
Total Octachlorobiphenyls	127	pg/g	0.152		
Total Nonachlorobiphenyls	49.9	pg/g	0.179		
209 - Decachlorobiphenyl	12.7	pg/g	0.114		
Total Polychlorinated Biphenyls	2000	pg/g			

SLC
10-8-01

Sample Results

Sample FS-15-WG-R Fish: White Grunt

Lab ID L3606-51R Location: Reference

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	3.63	pg/g	0.166		
18 - 2,2',5-Trichlorobiphenyl	ND	pg/g	3.49	U	MB-I
28 - 2,4,4'-Trichlorobiphenyl	18.9	pg/g	0.129	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	ND	pg/g	12.4	U	MB-I
49 - 2,2',4,5'-Tetrachlorobiphenyl	7.24	pg/g	0.0769	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	16.3	pg/g	0.0888		
66 - 2,3',4,4'-Tetrachlorobiphenyl	23.8	pg/g	0.451		
77 - 3,3',4,4'-Tetrachlorobiphenyl	1.74	pg/g	0.589		
87 - 2,2',3,4,5-Pentachlorobiphenyl	21.9	pg/g	0.142	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	59.7	pg/g	0.143	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	63.3	pg/g	2.29		
118 - 2,3',4,4',5-Pentachlorobiphenyl	184	pg/g	2.1		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	2.8		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	40.9	pg/g	0.443	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	260	pg/g	0.443	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	373	pg/g	0.379	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	26.6	pg/g	0.824		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	0.443		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	38.4	pg/g	0.299	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	94.4	pg/g	0.235	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	29.2	pg/g	0.263	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.479	pg/g	0.174		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	93.4	pg/g	0.24		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	4.35	pg/g	0.152		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	29.2	pg/g	0.179		
209 - Decachlorobiphenyl	12.7	pg/g	0.114		

SLC
10-8-01

Sample Results

Sample FS-06-WG-T

Fish: White Grunt

Lab ID L3606-45R

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	10.1		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2540	pg/g	23.9		
114 - 2,3,4,4',5-Pentachlorobiphenyl	160	pg/g	24.4		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6870	pg/g	21		
123 - 2',3,4,4',5-Pentachlorobiphenyl	88.4	pg/g	25.9		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	8		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	797	pg/g	4.94		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	195	pg/g	5.24		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	280	pg/g	3.77		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.47		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	710	pg/g	0.397	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1840	pg/g	0.321	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	24.8	pg/g	0.552		

SLC
10-8-01

Sample Results

Sample FS-06-WG-T

Fish: White Grunt

Lab ID L3606-45R

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	0.522	pg/g	0.213		
Total Dichlorobiphenyls	7.57	pg/g	0.351		
Total Trichlorobiphenyls	139	pg/g	0.338		
Total Tetrachlorobiphenyls	2630	pg/g	10.1		
Total Pentachlorobiphenyls	20100	pg/g	32.8		
Total Hexachlorobiphenyls	19600	pg/g	6.45		
Total Heptachlorobiphenyls	4700	pg/g	0.552		
Total Octachlorobiphenyls	1050	pg/g	0.47		
Total Nonachlorobiphenyls	143	pg/g	0.359		
209 - Decachlorobiphenyl	11.6	pg/g	0.322		
Total Polychlorinated Biphenyls	48400	pg/g			

SLC
10-8-01

Sample Results

Sample FS-06-WG-T Fish: White Grunt

Lab ID L3606-45R Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	2.95	pg/g	0.242		
18 - 2,2',5-Trichlorobiphenyl	6.1	pg/g	0.249	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	27.7	pg/g	0.189	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	163	pg/g	0.298	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	145	pg/g	0.276	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	421	pg/g	0.322		
66 - 2,3',4,4'-Tetrachlorobiphenyl	634	pg/g	9.62		
77 - 3,3',4,4'-Tetrachlorobiphenyl	ND	pg/g	10.1		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1100	pg/g	1.1	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2760	pg/g	1.12	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2540	pg/g	23.9		
118 - 2,3',4,4',5-Pentachlorobiphenyl	6870	pg/g	21		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	8		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1240	pg/g	4.89	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	6750	pg/g	4.86	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6670	pg/g	4.56	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	797	pg/g	4.94		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	4.47		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	710	pg/g	0.397	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1840	pg/g	0.321	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	443	pg/g	0.362	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	ND	pg/g	0.561	U	ID(IR)-I
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	962	pg/g	0.327		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	87.5	pg/g	0.47		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	99.6	pg/g	0.359		
209 - Decachlorobiphenyl	11.6	pg/g	0.322		

SLC
10-8-01

Sample Results

Sample FS-12-WG-T

Fish: White Grunt

Lab ID L3606-20

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	82.2	pg/g	23.7		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	15300	pg/g	276		
114 - 2,3,4,4',5-Pentachlorobiphenyl	977	pg/g	5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	50100	pg/g	259		
123 - 2',3,4,4',5-Pentachlorobiphenyl	565	pg/g	5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5		
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6800	pg/g	31.8		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	1600	pg/g	33.5		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	2520	pg/g	5.23		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	6.39		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	5210	pg/g	0.378	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10400	pg/g	0.299	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	246	pg/g	1.04		

SLC 10-8-01

Sample Results

Sample FS-12-WG-T

Fish: White Grunt

Lab ID L3606-20

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.93	pg/g	0.155		
Total Dichlorobiphenyls	178	pg/g	0.533		
Total Trichlorobiphenyls	7980	pg/g	0.502		
Total Tetrachlorobiphenyls	66500	pg/g	7		
Total Pentachlorobiphenyls	196000	pg/g	5		
Total Hexachlorobiphenyls	163000	pg/g	7.82		
Total Heptachlorobiphenyls	31500	pg/g	1.04		
Total Octachlorobiphenyls	6380	pg/g	0.637		
Total Nonachlorobiphenyls	911	pg/g	0.18		
209 - Decachlorobiphenyl	54.9	pg/g	0.0547		
Total Polychlorinated Biphenyls	473000	pg/g			

gc
10-8-09

Sample Results

Sample FS-12-WG-T Fish: White Grunt

Lab ID L3606-20 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	35.2	pg/g	0.364		
18 - 2,2',5-Trichlorobiphenyl	105	pg/g	0.0881	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	604	pg/g	0.445	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	4390	pg/g	0.0678	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	9060	pg/g	0.0635	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	22100	pg/g	0.15		
66 - 2,3',4,4'-Tetrachlorobiphenyl	8190	pg/g	43.4		
77 - 3,3',4,4'-Tetrachlorobiphenyl	82.2	pg/g	23.7		
87 - 2,2',3,4,5-Pentachlorobiphenyl	9530	pg/g	0.669	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	43600	pg/g	14.8	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	15300	pg/g	276		
118 - 2,3',4,4',5-Pentachlorobiphenyl	50100	pg/g	259		
126 - 3,3',4,4',5-Pentachlorobiphenyl	ND	pg/g	5		
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	8110	pg/g	6.52	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	53900	pg/g	6.33	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	50600	pg/g	39.8	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	6800	pg/g	31.8		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	6.39		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	5210	pg/g	0.378	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	10400	pg/g	0.299	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	2710	pg/g	0.321	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	6.15	pg/g	0.218		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	6370	pg/g	0.297		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	432	pg/g	0.637		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	637	pg/g	0.18		
209 - Decachlorobiphenyl	54.9	pg/g	0.0547		

SEC
10-8-01

Sample Results

Sample FS-13-WG-T

Fish: White Grunt

Lab ID L3606-12

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.26	pg/g	1.09		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1550	pg/g	1.17		
114 - 2,3,4,4',5-Pentachlorobiphenyl	103	pg/g	1.18		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4300	pg/g	1		
123 - 2',3,4,4',5-Pentachlorobiphenyl	45.1	pg/g	1.26		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.71	pg/g	1.48	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	587	pg/g	0.961		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	130	pg/g	0.963		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	200	pg/g	1.04		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	596	pg/g	0.126	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1650	pg/g	0.0966	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	23.1	pg/g	0.245		

SLC
10-8-01

Sample Results

Sample FS-13-WG-T

Fish: White Grunt

Lab ID L3606-12

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.08	pg/g	0.0869		
Total Dichlorobiphenyls	14.8	pg/g	0.155		
Total Trichlorobiphenyls	140	pg/g	0.105		
Total Tetrachlorobiphenyls	3210	pg/g	1.09		
Total Pentachlorobiphenyls	14600	pg/g	1.48		
Total Hexachlorobiphenyls	14000	pg/g	1.31		
Total Heptachlorobiphenyls	4920	pg/g	0.245		
Total Octachlorobiphenyls	1530	pg/g	0.368		
Total Nonachlorobiphenyls	285	pg/g	0.0941		
209 - Decachlorobiphenyl	17.3	pg/g	0.0588		
Total Polychlorinated Biphenyls	38700	pg/g			

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Sample Results

Sample FS-13-WG-T Fish: White Grunt

Lab ID L3606-12 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	5.02	pg/g	0.115		
18 - 2,2',5-Trichlorobiphenyl	13.4	pg/g	0.0746	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	35.4	pg/g	0.0833	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	224	pg/g	0.0532	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	358	pg/g	0.0498	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	702	pg/g	0.0547		
66 - 2,3',4,4'-Tetrachlorobiphenyl	473	pg/g	1.09		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.26	pg/g	1.09		
87 - 2,2',3,4,5-Pentachlorobiphenyl	1000	pg/g	0.194	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	2420	pg/g	0.193	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1550	pg/g	1.17		
118 - 2,3',4,4',5-Pentachlorobiphenyl	4300	pg/g	1		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.71	pg/g	1.48	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	627	pg/g	1.31	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4150	pg/g	1.31	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	4710	pg/g	1.31	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	587	pg/g	0.961		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.2		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	596	pg/g	0.126	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1650	pg/g	0.0966	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	499	pg/g	0.105	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	1.05	pg/g	0.0715		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1140	pg/g	0.0988		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	108	pg/g	0.368		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	199	pg/g	0.0941		
209 - Decachlorobiphenyl	17.3	pg/g	0.0588		

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Sample Results

Sample FS-19-WG-T

Fish: White Grunt

Lab ID L3606-14

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.98	pg/g	0.809		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	796	pg/g	0.876		
114 - 2,3,4,4',5-Pentachlorobiphenyl	50	pg/g	0.877		
118 - 2,3',4,4',5-Pentachlorobiphenyl	2530	pg/g	0.777		
123 - 2',3,4,4',5-Pentachlorobiphenyl	27.6	pg/g	0.92		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.61	pg/g	1.05	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	343	pg/g	1.17		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	77	pg/g	1.17		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	123	pg/g	1.14		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.37		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	713	pg/g	0.159	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	3590	pg/g	0.122	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	23.1	pg/g	0.425		

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Sample Results

Sample FS-19-WG-T

Fish: White Grunt

Lab ID L3606-14

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.47	pg/g	0.122		
Total Dichlorobiphenyls	33.6	pg/g	0.177		
Total Trichlorobiphenyls	441	pg/g	0.257		
Total Tetrachlorobiphenyls	2740	pg/g	0.81		
Total Pentachlorobiphenyls	9080	pg/g	1.05		
Total Hexachlorobiphenyls	10100	pg/g	1.95		
Total Heptachlorobiphenyls	9660	pg/g	0.425		
Total Octachlorobiphenyls	6200	pg/g	0.741		
Total Nonachlorobiphenyls	1140	pg/g	0.2		
209 - Decachlorobiphenyl	24.1	pg/g	0.107		
Total Polychlorinated Biphenyls	39400	pg/g			

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Sample Results

Sample FS-19-WG-T Fish: White Grunt

Lab ID L3606-14 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	8.76	pg/g	0.131		
18 - 2,2',5-Trichlorobiphenyl	70.6	pg/g	0.107	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	37.4	pg/g	0.215	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	189	pg/g	0.0691	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	506	pg/g	0.0647	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	757	pg/g	0.0711		
66 - 2,3',4,4'-Tetrachlorobiphenyl	275	pg/g	0.81		
77 - 3,3',4,4'-Tetrachlorobiphenyl	7.98	pg/g	0.809		
87 - 2,2',3,4,5-Pentachlorobiphenyl	615	pg/g	0.285	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	1740	pg/g	0.284	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	796	pg/g	0.876		
118 - 2,3',4,4',5-Pentachlorobiphenyl	2530	pg/g	0.777		
126 - 3,3',4,4',5-Pentachlorobiphenyl	1.61	pg/g	1.05	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	384	pg/g	1.57	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2530	pg/g	1.52	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	3880	pg/g	1.31	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	343	pg/g	1.17		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	1.37		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	713	pg/g	0.159	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	3590	pg/g	0.122	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	1120	pg/g	0.132	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	0.885	pg/g	0.0902		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2570	pg/g	0.125		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	417	pg/g	0.741		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	833	pg/g	0.2		
209 - Decachlorobiphenyl	24.1	pg/g	0.107		

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Sample Results

Sample FS-20-WG-T

Fish: White Grunt

Lab ID L3606-32

Location: Target

Class: Dioxin-Like PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
77 - 3,3',4,4'-Tetrachlorobiphenyl	13.1	pg/g	3.96		
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2820	pg/g	1.5		
114 - 2,3,4,4',5-Pentachlorobiphenyl	184	pg/g	1.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7990	pg/g	29.3		
123 - 2',3,4,4',5-Pentachlorobiphenyl	87	pg/g	1.5		
126 - 3,3',4,4',5-Pentachlorobiphenyl	7.62	pg/g	1.5	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	1220	pg/g	11.3		
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	277	pg/g	11.1		
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	425	pg/g	1.8		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.07		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1710	pg/g	0.233	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	4770	pg/g	0.178	J	EMPC(C)-H
189 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl	58.9	pg/g	0.491		

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Sample Results

Sample FS-20-WG-T

Fish: White Grunt

Lab ID L3606-32

Location: Target

Class: Homologue Groups

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
Total Monochlorobiphenyl	1.5	pg/g	0.094		
Total Dichlorobiphenyls	27.5	pg/g	0.214		
Total Trichlorobiphenyls	316	pg/g	0.257		
Total Tetrachlorobiphenyls	7230	pg/g	3.96		
Total Pentachlorobiphenyls	33600	pg/g	1.5		
Total Hexachlorobiphenyls	34600	pg/g	2.8		
Total Heptachlorobiphenyls	14900	pg/g	0.491		
Total Octachlorobiphenyls	5340	pg/g	0.773		
Total Nonachlorobiphenyls	806	pg/g	0.177		
209 - Decachlorobiphenyl	44.5	pg/g	0.0387		
Total Polychlorinated Biphenyls	96900	pg/g			

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Sample Results

Sample FS-20-WG-T Fish: White Grunt

Lab ID L3606-32 Location: Target

Class: Environmentally Relevant PCBs

Parameter	Concentration	Units	Detection Limit	Validation Qualifier	Qualifier Code
8 - 2,4'-Dichlorobiphenyl	13.5	pg/g	0.146		
18 - 2,2',5-Trichlorobiphenyl	13.7	pg/g	0.084	J	EMPC(C)-H
28 - 2,4,4'-Trichlorobiphenyl	82	pg/g	0.226	J	EMPC(C)-H
44 - 2,2',3,5'-Tetrachlorobiphenyl	622	pg/g	0.0531	J	EMPC(C),CRM-H
49 - 2,2',4,5'-Tetrachlorobiphenyl	642	pg/g	0.0489	J	EMPC(C)-H
52 - 2,2',5,5'-Tetrachlorobiphenyl	1860	pg/g	0.0568		
66 - 2,3',4,4'-Tetrachlorobiphenyl	807	pg/g	3.49		
77 - 3,3',4,4'-Tetrachlorobiphenyl	13.1	pg/g	3.96		
87 - 2,2',3,4,5-Pentachlorobiphenyl	3250	pg/g	0.364	J	EMPC(C)-H
101 - 2,2',4,5,5'-Pentachlorobiphenyl	5580	pg/g	0.366	J	EMPC(C)-H
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2820	pg/g	1.5		
118 - 2,3',4,4',5-Pentachlorobiphenyl	7990	pg/g	29.3		
126 - 3,3',4,4',5-Pentachlorobiphenyl	7.62	pg/g	1.5	J	EMPC(C)-H
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1600	pg/g	2.25	J	EMPC(C)-H
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	10100	pg/g	2.17	J	EMPC(C)-H
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	10600	pg/g	1.9	J	EMPC(C)-H
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	1220	pg/g	11.3		
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	ND	pg/g	2.07		
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1710	pg/g	0.233	J	CRM-L
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	4770	pg/g	0.178	J	EMPC(C)-H
183 - 2,2',3,4,4',5',6-Heptachlorobiphenyl	1480	pg/g	0.196	J	EMPC(C)-H
184 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl	3.71	pg/g	0.13		
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	3310	pg/g	0.181		
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	337	pg/g	0.773		
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	570	pg/g	0.177		
209 - Decachlorobiphenyl	44.5	pg/g	0.0387		

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Method 680. Determination of Pesticides and PCBs in Water and Soil/Sediment by Gas Chromatography/Mass Spectrometry

November 1985

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1. SCOPE AND APPLICATION

1.1. This method provides procedures for mass spectrometric determination of polychorinated biphenyls (PCBs) and the listed pesticides in water, soil, or sediment: This method is applicable to samples containing PCBs as single congeners or as complex mixtures, such as commercial Aroclors. PCBs are identified and measured as isomer groups (i.e., by level of chlorination). The existance of 209 possible PCB congeners makes impractical the listing of the Chemicsl Abstracts Service Registry Number (CASRN) for each potential method analyte. Because PCBs are identified and measured as isomer groups, the non-specific CASRN for each level of chlorination is used to describe method analytes.

Analyte(s)	Formula	CASRN
Aldrin	$C_{12}H_8Cl_6$	309-00-2
BHCs		
alpha isomer	$C_6H_6Cl_6$	319-84-6
beta isomer	$C_6H_6Cl_6$	319-85-7
delta isomer	$C_6H_6Cl_6$	319-86-8
gamma isomer (lindane)	$C_6H_6Cl_6$	58-89-9
Chlordane (technical		57-74-9
alpha-chlordane	$C_{10}H_6Cl_8$	5103-71-9
gamma-chlordane	$C_{10}H_6Cl_8$	5103-74-2
trans-nonachlor	$C_{10}H_5Cl_9$	39765-80-5
4,4'-DDD	$C_{14}H_{10}Cl_4$	72-54-8
4,4'-DDE	$C_{14}H_8Cl_4$	72-55-9
4,4-DDT	$C_{14}H_9Cl_5$	50-29-3
Dieldrin	$C_{12}H_8C_{l6}O$	60-57-1
Endosulfan I	$C_9H_6Cl_6O_3S$	959-98-8
Endosulfan II	$C_8H_6Cl_6O_3S$	33213-65-9
Endosulfan sulfate	$C_9H_4Cl_6O_4S$	1031-07-8
Endrin	$C_{12}H_8Cl_6O$	72-20-8
Endrin aldehyde	$C_{12}H_8Cl_6O$	7421-93-4
Endrin ketone	$C_{12}H_8Cl_6O$	53494-70-5
Heptachlor	$C_{10}H_5Cl_7$	76-44-8
Heptachlor epoxide	$C_{10}H_5Cl_7O$	1024-57-3
Methoxychlor	$C_{16}H_{15}Cl_3O_2$	72-43-5
PCBs		
Monochlorobiphenyls	$C_{12}H_9Cl$	27323-18-8
Dichlorobiphenyls	$C_{12}H_8Cl_2$	25512-42-9
Trichlorobiphenyls	$C_{12}H_7Cl_3$	25323-68-6
Tetrachlorobiphenyls	$C_{12}H_6Cl_4$	26914-33-0
Pentachlorobiphenyls	$C_{12}H_5Cl_5$	25429-29-2
Hexachlorobiphenyls	$C_{12}H_4Cl_6$	26601-64-9
Heptachlorobiphenyls	$C_{12}H_3Cl_7$	28655-71-2
Octachlorobiphenyls	$C_{12}H_2Cl_8$	31472-83-0
Nonachlorobiphenyls	$C_{12}HCl_9$	53742-07-7
Decachlorobiphenyls	$C_{12}Cl_{10}$	2051-24-3

1.2 Detection limits vary among method analytes and with sample matrix, sample preparation procedures, condition of the GC/MS system, type of data acquisition, and individual samples. The calculated method detection limit (MDL) for each pesticide in fortified reagent water extracts analyzed with full-range data acquisition is presented in Sect. 14. Analysis of calibration solutions indicated that the calculated MDLs do not accurately reflect instrumental detection limits. The following guidance is based on numerous analyses of calibration solutions with one instrument over a period of approximately 6 months. Pesticide analytes other than endosulfans I and II can be identified and accurately measured when the injected aliquot contains 2 ng of each analyte; the endosulfans require about 4 ng each. With selected-ion-monitoring (SIM) data acquisition, pesticide analyte detection limits are lowered by at least a factor of five. Detection limits for individual PCB congeners increase with increasing number of chlorine atoms, with the detection limit for decachlorobiphenyl being about 5-10 times higher than that of a monochlorobiphenyl. A monochlorobiphenyl can be identified and accurately measured when the injected extract aliquot contains 1 ng and full-range data are acquired. The detection limit for total PCBs will depend on the number of individual PCB congeners present. SIM data acquisition procedures reduce the detection limit for PCBs by at least a factor of three.

2. SUMMARY OF METHOD

A 1-L water sample is placed in a separatory funnel and extracted with methylene chloride. Appropriate extraction procedures for soil/sediment samples will be added when results are obtained from ongoing experiments. The extract is dried and exchanged to hexane during concentration to a final volume of 1 mL or less. Sample extract components are separated with capillary column gas chromatography (GC) and identified and measured with low resolution, electron ionization mass spectrometry (MS). An interfaced data system (DS) to control data acquisition and to store, retrieve, and manipulate mass spectral data is essential. Either full-range or selected-ion-monitoring (SIM) data are acquired, depending on the concentration range of concern. If full-range data are acquired, all method analytes can be identified and measured with one GC/MS analysis. If all pesticides and PCBs must be determined and if SIM data are necessary to meet required detection limits, two GC/MS analyses are necessary, one to detect and measure pesticides and one to detect and measure PCBS.

Two surrogate compounds are added to each sample before sample preparation; these compounds are $^{13}C_{12}$-4,4'-DDT and $^{13}C_6$-gamma-BHC. Two internal standards, chrysene-d_{12} and phenanthrene-d_{10}, are added to each sample extract before GC/MS analysis and are used to calibrate MS response. Each concentration measurement is based on an integrated ion abundance of one characteristic ion. All pesticides are identified as individual compounds, and a concentration is calculated by relating the MS response of each compound to the MS response of the internal standard with GC retention time nearer that of the pesticide analyte. The extent of sample contamination with technical chlordane is indicated by identification and measurement of the two most persistent components, gamma-chlordane and nonachlor. (Alpha-chlordane and heptachlor, other major

components of technical chlordane, may also be present and will be detected and measured with this method.)

PCBs are identified and measured as isomer groups (i.e., by level of chlorination). A concentration is measured for each PCB isomer group total; PCB concentration in each sample extract is obtained by summing isomer group concentrations.

Nine selected PCB congeners are used as calibration standards, and one internal standard, chrysene-d_{12}, is used to calibrate MS response to PCBs, unless sample conditions require the use of the second internal standard, phenanthrene-d_{10}.

3. DEFINITIONS

3.1 CONCENTRATION CALIBRATION SOLUTION (CAL) -- A solution of method analytes used to calibrate the mass spectrometer response.

3.2 CONGENER NUMBER -- Throughout this method, individual PCBs are described with the number assigned by Ballschmiter and Zell (2). (This number is also used to describe PCB congeners in catalogs produced by Ultra Scientific, Hope, RI.)

3.3 INTERNAL STANDARD -- A pure compound added to a sample extract in known amounts and used to calibrate concentration measurements of other compounds that are sample components. The internal standard must be a compound that is not a sample component.

3.4 LABORATORY DUPLICATES (LD1 and LD2) --Two sample aliquots taken in the analytical laboratory are analyzed with identical procedures. Analysis of laboratory duplicates indicates precision associated with laboratory procedures but not with sample collection, preservation or storage procedures.

3.5 LABORATORY PERFORMANCE CHECK SOLUTION (LPC) -- A solution of method analytes, surrogate compounds, and internal standards used to evaluate the performance of the GC/MS/DS with respect to a defined set of method criteria.

3.6 LABORATORY REAGENT BLANK (LRB) -- An aliquot of reagent water or neutral solid reference material that is treated as a sample. It is exposed to all glassware and apparatus, and all method solvents, reagents, internal standards, and surrogate compounds are used. The extract is concentrated to the final volume used for samples and is analyzed the same as a sample extract.

3.7 LABORATORY SPIKE DUPLICATE SAMPLE-- One aliquot (LSD) of a sample is analyzed before fortification with any method analytes. In the laboratory, a known quantity of method analytes (LSA) is added to two independent aliquots of the same sample, and final analyte concentrations (LF1 and LF2) are measured with the same analytical procedures used to measure LSD.

3.8 LABORATORY SURROGATE SPIKE

3.8.1 Measured Value (LS1) -- Surrogate compound concentration measured with the same procedures used to measure sample components.

3.8.2 Theoretical Value (LS2) The concentration of surrogate compound added to a sample aliquot before extraction. This value is determined from standard gravimetric and volumetric techniques used during sample fortification.

3.9 METHOD DETECTION LIMIT (MDL) -- A statistically determined value (1) indicating the minimum concentration of an analyte that can be identified and measured in a sample matrix with 99% confidence that the analyte concentration is greater than zero. This value varies with the precision of the replicate measurements used for the calculation.

3.10 PERFORMANCE EVALUATION SAMPLE -- A sample containing known concentrations of method analytes that has been analyzed by multiple laboratories to determine statistically the accuracy and precision that can be expected when a method is performed by a competent analyst. Analyte concentrations are unknown to the analyst.

3.11 QUALITY CONTROL (QC) CHECK SAMPLE -- A sample containing known concentrations of analytes that is analyzed by a laboratory to demonstrate that it can obtain acceptable identifications and measurements with procedures to be used to analyze environmental samples containing the same or similar analytes. Analyte concentrations are known by the analyst. Preparation of the QC check sample by a laboratory other than the laboratory performing the analysis is highly desirable.

3.12 SURROGATE COMPOUND -- A compound not expected to be found in the sample is added to a sample aliquot before extraction and is measured with the same procedures used to measure sample components. Associated with the surrogate compound are two values, laboratory surrogate spike- measured value (LS1) and laboratory surrogate spike - theoretical value (LS2). The purpose of a surrogate compound is to monitor method performance with each sample.

4. INTERFERENCES

4.1 Interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing equipment. Laboratory reagent blanks (LRBs) are analyzed routinely to demonstrate that these materials are free of interferences under the analytical conditions used for samples.

4.2 To minimize interferences, glassware (including sample bottles) should be meticulously cleaned. As soon as possible after use, rinse glassware with the last solvent used. Than wash with detergent in hot water and rinse with tap water followed by distilled water. Drain dry and heat in a muffle furnace at 450°C for a

few hours. After cooling, store glassware inverted or covered with aluminum foil. Before using, rinse each piece with an appropriate solvent. Volumetric glassware should not be heated in a muffle furnace.

4.3 For both pesticides and PCBs, interference can be caused by the presence of much greater quantities of other sample components that overload the capillary column; additional sample extract preparation procedures must then be used to eliminate interferences. Capillary column GC retention time and the compound-specific characteristics of mass spectra eliminate many interferences that formerly were of concern with pesticide/PCB determinations with electron capture detection. The approach and identification criteria used in this method for PCBs eliminate interference by most chlorinated compounds other than other PCBs. With the isomer group approach, coeluting PCBs that contain the same minor of chlorines are identified and measured together. Therefore, coeluting PCBs are a problem only if they contain a different number of chlorine atoms. This interference problem is obviated by rigorous application of the identification criteria described in this method.

4.4 For SIM identification and measurement of pesticides, other chlorinated sample components that produce the same quantitation and confirmation ions may interfere, but only if retention times are nearly equivalent.

5. SAFETY

5.1 The toxicity or carcinogenicity of each chemical used in this method has not been precisely defined. Therefore, each should be treated as a potential health hazard, and exposure should be reduced to the lowest feasible level. Each laboratory is responsible for safely disposing materials and for maintaining awareness of OSHA regulations regarding safe handling of the chemicals used in this method. A reference file of material data handling sheets should be made available to all personnel involved in analyses. Additional information on laboratory safety is available (3-5).

5.2 The following method analytes have been classified as known or suspected human or mammalian carcinogens: BHCs, 4,4'-DDD, 4,4'-DDT, and PCBs. Primary standards of these compounds should be prepared in a hood. A toxic gas respirator should be worn when the analyst handles solutions containing high concentrations of these compounds.

6. APPARATUS AND EQUIPMENT

6.1 SAMPLING EQUIPMENT

6.1.1 Water Sample Bottles -- Meticulously cleaned (Sect. 4.2) 1-L or l-qt amber glass fitted with a Teflon-lined screw cap. (Bottles in which high purity solvents were received can be used as sample bottles without additional cleaning if they have been handled carefully to avoid contamination during and after use of original contents.)

6.1.2 Soil/Sediment Sample Bottles -- Appropriate containers will be specified when appropriate extraction procedures are determined.

6.2 GLASSWARE

6.2.1 Separatory Funnel -- 2-L with Teflon stopcock.

6.2.2 Drying Column -- glass colum approximately 400 mm long X 19 mm ID with coarse trit filter disc.

6.2.3 Chromatography Column -- glass column approximately 400 mm long X 19 m ID with coarse frit filter disc and Teflon stopcock.

6.2.4 Concentrator Tube -- 10-mL graduated Kuderna-Danish design with ground-glass stopper.

6.2.5 Evaporative Flask -- 500 mL Kuderna-Danish design that is attached to concentrator tube with springs.

6.2.6 Snyder Column -- three-ball macro Kuderna-Danish design.

6.2.7 vials--10- to 15 mL amber glass with Teflon-lined screw caps.

6.3 COMPUTERIZED GC/MS

6.3.1 The GC must be capable of temperature programming and be equipped with all required accessories, such as syringes, gases, and a capillary column. The GC injection port must be designed for capillary columns. Manual splitless injections were used to acquire data used as the basis desirable, because it should provide more precise retention times and because high mass descrimination and analyte degradation problems are minimized with this technique. With some GCs, however, the irreproducibility of the low initial column temperature required for on-column injection will cause irreproducible retention times (Rts) and relative retention times (RRTs). That can result in an inability to distinguish between two closely-eluting pesticide isomers and may cause ion sets to be changed at inappropriate times during SIM data acquisition. Splitting injections are not recommended.

6.3.2 Either full range or SIM mass spectral data are obtained with electron ionization at a nominal electron energy of 70 eV. To ensure sufficient precision of mass spectral data, the required MS scan rate must allow acquisition of at least five full-range mass spectra or five data points for each n=monitored ion while a sample component elutes from the GC. The MS must produce a mass spectrum meeting all criteria for $\leq$20 ng of decafluorotriphenylphosphine (DFTPP) introduced through the GC inlet.

6.3.3 An interfaced data system (DS) is required to acquire, store, reduce, and output mass spectral data. The DS must be capable of searching a data file for specific ions and plotting ion abundances versus time or spectrum number to produce selected ion current profiles (SICPs) and extracted ion current profiles (EICPs). Also required is the capability to obtain chromatographic peak areas between specified times or spectrum numbers in SICPs or EICPs. Total data acquisition time per cycle should be $\geq$0.5 s and must not exceed 1.5 s.

6.3.4 SIM Option – For SIM data acquisition, the DS must be equipped with software capable of acquiring data for multiple groups of ions, and the DS must allow automated and rapid changes of the set of ions being monitored. To acquire all PCB data needed for implementation of two currently-available automated interpretation procedures, the SIM program must be capable of acquiring data for four groups (or mass ranges) each consisting of $\leq$35 ions or for four groups of $\leq$20 ions each. The times spent monitoring ions during sample analyses must be the same as the times used when calibration solutions were analyzed.

6.4 GC COLUMN – A 30 m X 0.32 mm ID fused silica capillary column coated with a 0.25 um or thicker film crosslinked phenyl methyl silicone (such as Durabond-5 (DB-5), J and W Scientific, Rancho Cordova, CA) or polydiphenyl vinyl dimethyl siloxane (such as SE-54, Alltech Associates, Deerfield, IL) is required. Operationg conditions known to produce acceptable results with these columns are shown in Table 1; separation of pesticide analytes and PCB calibration congeners with a DB-5 column and those operating conditions is shown in Figure 1. Retention times have been reported (6) for all 209 PCB congeners with an SE-54 column , which provides the same retention order for PCBs and essentially the same separation capabilities as a DB-5 column.

6.5 MISCELLANEOUS EQUIPMENT

6.5.1 Volumetric flasks - 2-mL, 5-mL, 10-mL, 25-mL, and 50-mL with ground glass stoppers.

6.5.2 Microsyringes - various standard sizes.

6.5.3 Boiling Chips -- approximately 10/40 mesh. Heat at 400°C for 30 min or extract with methylene chloride in a Soxhlet apparatus.

6.5.4 Water Bath -- heated, with concentric ring cover, capable of temperature control within ± 2° C.

6.5.5 Analytical Balance-- capable of accurately weighing to 0.0001 g.

7. REAGENTS AND CONSUMABLE MATERIALS

7.1 SOLVENTS -- High purity, distilled-in-glass hexane and methylene chloride. For precise injections with splitless injectors and capillary columns, all samples and standards should be contained in the same solvent. Effects of minor variations in solvent composition (i.e., small percentage of another solvent remaining in hexane extracts) are minimized with the use of internal standards. (External standard calibration is not acceptable.)

7.2 SODIUM SULFATE - ACS, granular, anhydrous. Purify by heating at 400° C for 4 h in a shallow tray.

7.3 SODIUM TRIOSULFATE - ACS, granular

7.4 TETRABUTYLAMMONIUM SULFITE REAGENT - Dissolve 3.39 g of tetrabutylammonium hydrogen sulfate in 100 ml distilled water. To remove impurities, extract solution three times with 20 mL portions of hexane. Discard the hexane extracts and add 25 g of sodium sulfate to the water solution. Store the resulting solution in an amber bottle with a Teflon-lined screw cap. The solution can be stored at room temperature for at least one month.

7.5. MS PERFORMANCE CHECK SOLUTION - Prepare a 10 ng/uL solution of decafluorotriphenylphosphine (DFTPP) in an appropriate solvent.

7.6 INTERNAL STANDARDS - Chrysene-d_{12} and phenanthrene-d_{10} are used an internal standards. They are added to each sample extract just before analysis and are contained in all calibration/performance check solutions.

7.7 SURROGATE COMPOUNDS - $^{13}C_{12}$-4,4'-DDT and $^{13}C_6$-gamma-BHC are added to every sample before extraction and are included in every calibration/performance check solution.

7.8 PCB CONCENTRATION CALIBRATION CONGENERS - The nine individual PCB congeners listed in Table 2 are used as concentration calibration compounds for PCB determinations. One isomer at each level of chlorination is used as the concentration calibration standard for all other isomers at that level of chlorination, except that decachlorobiphenyl (Cl_{10}) is used for both Cl_9 and Cl_{10} isomer groups. The basis for selection of these calibration congeners has been reported (7).

7.9 PCB RETENTION TIME CONGENERS FOR SIM DATA ACQUISITION OPTION -- Knowledge of the retention time of certain congeners is necessary to determine when to acquire data with each ion set. Two concentration calibration congeners also serve as retention time congeners; the first eluting Cl_1-PCB indicates the time when data acquisition must have been initiated for ion set #1, and the Cl_{10}-PCB indicates when all PCBs have eluted. Two or three additional PCB congeners are used to establish times to initiate data acquisition with other ion sets (Sect. 9.4).

7.10 PESTICIDE SOLUTIONS

7.10.1 Pesticide Stock Solutions -- Prepare from pure standard materials. Weigh approximately 25.0 mg (with accuracy of 0.1 mg) of each surrogate compound and each pure pesticide analyte, except Endosulfan I and Endosulfan II. For those two pesticides, prepare a stock solution twice as concentrated as that prepared for other pesticide analytes. Dissolve each compound in hexane and dilute to volume in a 10-mL (5-mL for the two Endosulfans) volumetric flask. (Concentration of each component = 2.5 mg/mL, except Endosulfans, which should be 5 mg/mL.) Smaller or larger volumes of stock solution may be used if desired. If compound purity is certified at $\geq$96%, the weight can be used without correction to calculate the concentration of the stock standard solution. Commercially prepared stock standards in hexane can be used at any concentration if they are traceable to USEPA-supplied standards.

7.10.2 Pesticide Primary Dilution Solutions -- A convenient approach to solution preparation is to prepare two pesticide primary dilution solutions that are twice the concentration of the highest concentration calibration solution required. These solutions can then be diluted as necessary to prepare all needed calibration solutions. One solution contains endrin aldehyde and one does not, because the medium level calibration solution does not contain endrin aldehyde. Place 1 mL of each pesticide analyte/surrogate compound stock solution in a 25-mL volumetric flask. (Total volume for all 22 pesticide analytes and 2 surrogate compounds = 24 mL.) Make to volume with hexane and mix well. (Concentration of endosulfan sulfate, endosulfan I and endosulfan II = 200 ng/uL; concentration of each other component = 100 ng/uL.)

7.11 PCB SOLUTIONS

7.11.1 Stock Solutions of PCB Calibration Congeners -- Prepare a stock solution of each of the nine PCB concentration calibration congeners at a concentration of 1 ug/uL in hexane. (If SIM data are to be acquired, prepare a 1 ug/uL stock solution of each of the three retention time congeners also.) Place each solution in a clean glass vial with a Teflon-lined screw cap and store at 4°C if solutions are not to be used right away. Solutions are stable indefinitely if solvent evaporation is prevented.
CAUTION: Each time a vial containing small volumes of solutions is warmed to room temperature and opened, a small volume of solvent in the vial

headspace evaporates, significantly affecting concentration. Solutions should be stored with the smallest possible volume of headspace, and opening vials should be minimized.

7.11.2 PCB Primary Dilution Standard -- Take aliquots of the stock solutions of the nine PCB concentration calibration congeners and mix together-in the proportions of one part of each solution of the Cl_1 (#1), $C1_2$ (#5), and $C1_3$ (#29) congeners, two parts of each solution of the $C1_4$ (#50), $C1_5$ (#87), and $C1_6$ (#154) congeners, three parts of each solution of the $C1_7$ (#188) and Cl_8 (#200) congeners, and five parts of the Cl_{10} (#209) congener solution. (Note: The retention time congeners described in Sect. 7.9 are <u>not</u> included in the PCB primary dilution standard because they are not needed for full-range data acquisition.) This will provide a primary dilution standard solution of the composition shown in Table 3. Calculate the concentration in ug/uL; use three significant figures. Place each solution in a clean glass vial with a Teflon-lined screw cap and store at 4°C. Mark the meniscus on the vial wall to monitor solution volume during storage; solutions are stable indefinitely if solvent evaporation in prevented.

7.12 INTERNAL STANDARD (IS) SOLUTIONS - Two solutions are needed to prepare concentration calibration solutions (CALs).

7.12.1 IS solution #1 (for full-range CALS) -- Weigh 7.5 mg ±0.1 mg each of phenanthrene-d_{10} and chrysene-d_{l2}; dissolve in hexane and dilute to 10 mL in a volumetric flask. (Concentration of each IS 750 ng/uL)

7.12.2 IS solution #2 (for SIM CALS) -- Take 1 mL of IS solution #1 and dilute to 10 mL in a volumetric flask. (Concentration of each IS = 75 ng/uL)

7.13 CALS FOR FULL RANGE DATA ACQUISITION -- Five hexane solutions are required. The solutions contain constant concentrations of the ISs (chrysene-d_{l2} and phenanthrene-d_{l2}) and varying concentrations of individual pesticide analytes, the nine PCB calibration compounds, and the two surrogate compounds ($^{13}C_{12}$-4,4'-DDT and $^{13}C_6$-gamma-BHC). (Composition and approximate concentrations are given in Table 4.) Four solutions (high and low concentrations) contain both ISs, both surrogate compounds, the nine PCB concentration calibration congeners, and each of the single-compound pesticide analytes. The fifth solution, the medium level concentration solution, contains all the above compounds except endrin aldehyde, which in not present for reasons described in Sect. 8. The lowest concentration solution contains each individual pesticide analyte and each PCB calibration congener at a concentration near but greater than its anticipated detection limit. (Because MS response to PCBs decreases with increasing level of chlorination, PCB congener concentrations in CALs increase with level of chlorination.) Components of the highest concentration solution (High CAL) are present at a concentration that allow injections of 2-uL, aliquots without MS saturation or GC column overloading.

7.13.1 The Full-Ranqe High CAL can be prepared by mixing equal portions of the PCB Primary dilution solution and the pesticide Primary dilution solution that contains endrin aldehyde and then adding an appropriate volume of IS solution #1. For example, 1 mL of each primary dilution solution and 20 uL of IS solution #1 provide the appropriate concentration for High CAL.

7.13.2 Other full-range CALS are prepared by diluting the primary dilution standard solutions and adding the appropriate amount of IS solution #1.
CAUTION: The pesticide primary dilution standard that does not contain endrin aldehyde must be used for the medium level full-range CAL.

7.14 CAL FOR SIM DATA ACQUISITION OPTION -- Two sets of solutions are needed, one set of five solutions for determinations of pesticide analytes, and one set of five solutions for PCB determinations. Appropriate concentrations of SIM CALs are given in Tables 5a and 5b. Solutions are prepared by diluting appropriate primary dilution standards and adding an appropriate volume of IS solution #2.
CAUTION: The pesticide SIM Medium CAL does not contain endrin aldehyde; the PCB SIM CALS must include the three PCB retention time congeners that are used to establish conditions for SIM data acquisition.

7.15 Prepare a solution of surrogate compounds in a water miscible solvent to provide a concentration in the sample/blank extract that is near the concentration anticipated for analytes when an aliquot of ≥20 uL is added to the sample before extraction.

7.16 Calculate the concentration (two significant figures if <100 and three significant figures if >100 ng/uL) of each component in each solution.
Note: Concentrations presented in tables are only approximate.

7.17 LABORATORY PERFORMANCE CHECK SOLUTION - For both full-range data acquisition, and the SIM data acquisition option, the Medium CAL is used as the laboratory performance check solution (LPC) to verify response factors and to demonstrate adequate GC resolution and MS performance.

8. SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 WATER SAMPLES

8.1.1 Samples must be collected in clean (Sect. 4.2) glass containers.
Note: When samples are anticipated to contain low concentrations of method analytes, a sample larger than 1-L may be needed. An effective sample collection procedure to minimize losses of hydrophobic analytes is to add a portion of extracting solvent to each sample container when the sample is collected. When a 1-gal sample is collected, an appropriate solvent volume is approximately 100 mL. (The entire sample must be used as one sample aliquot, and blank sample/solvent volumes must be adjusted also.)

8.1.2 Samples must be iced or refrigerated at 4°C from time of collection until extraction. If samples will not be extracted within 72 h after collection, use either sodium hydroxide or sulfuric acid to adjust sample pH to within a range of 5 to 9. Record the volume of acid or base used. If aldrin is to be determined, add sodium thiosulfate when residual chlorine is present. Field test kits are available for measurement of residual chlorine.

8.1.3 Samples should be extracted within 7 days after collection and analyzed within 40 days after extraction.

8.2 SOIL/SEDIMENT SAMPLES -- Appropriate procedures will be specified when results are obtained from ongoing experiments.

9. CALIBRATION

Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed and is required intermittently throughout sample analyses as dictated by results of continuing calibration checks. After initial calibration is successfully performed, a continuing calibration check is required at the beginning and end of each 12-h period during which analyses are performed. The Medium CALs for pesticide determinations do not include endrin aldehyde. This allows the Medium CAL to be used for continuing calibration checks, including a check to ensure that endrin decomposition is ≤10%. During initial calibration a separate Medium CAL containing endrin aldehyde and the internal standard is analyzed to determine the response factor for endrin aldehyde. Thereafter, if endrin aldehyde is a component of any sample and endrin decomposition is not a problem, the response factor for endrin aldehyde is verified by analyzing a calibration solution containing it.

9.1 DATA ACQUISITION OPTIONS -- Either full-range or SIM data acquisition may be used.

9.1.1 Full-range data acquisition is recommended if sample extract components are anticipated to be at sufficiently high concentrations.

9.1.2 SIM data acquisition will provide an increase in sensitivity by at least a factor of five for pesticide determinations and by at least a factor of three for PCB determinations.

9.2. INITIAL CALIBRATION

9.2.1 Calibrate and tune the MS with standards and procedures prescribed by the manufacturer with any necessary modifications to meet USEPA requirements.

9.2.2 Inject a I- uL or 2-uL aliquot of the 10 ng/uL DFTPP solution and acquire a mass spectrum that includes data for m/z 45-450. If the spectrum does not meet all criteria (Table 6), the MS must be hardware tuned to most all criteria before proceeding with calibration.

9.2.3 Full-Range Calibration -- Inject a 1- or 2-uL aliquot of the Medium CAL and acquire data from m/z 45 to 510. Acquire ≥5 spectra during elution of each GC peak. Total cycle time should be ≥0.5 s and ≤1.5 s.
Note: Either a 1- or 2-uL aliquot should be used consistently for CALs and sample/blank extracts.

9.2.4 SIM Calibration -- Acquire at least five data points for each ion during elution of each GC peak. Total cycle time should be ≥0.5 s and <1.5 s.
CAUTION: When acquiring SIM data, GC operating conditions must be carefully reproduced for each analysis to provide reproducible retention times; if not, ions will not be monitored at the appropriate times.

9.2.4.1 SIM Calibration for PCB determinations

9.2.4.1.1 Two options for SIM data acquisition are provided. Data can be acquired with four sets of ≤ six mass ranges (≤35 ions each as shown in Table7a) or with the five ion sets (≤20 ions each) shown in Tables 7b and 7c.

9.2.4.1.2 The time (scan number) for initiation of data acquisition with each ion set must be carefully determined from the retention times (scan numbers) of the retention time congeners. Approximate relative retention times of calibration congeners and approximate relative retention time windows for PCB isomer groups are shown in Table 8. (Also see Figures 1 and 2.)

9.2.4.1.3 SIM data acquisition with four ion sets. Begin data acquisition with Ion Set #1 before elution of PCB congener #1, the first eluting Cl_1-PCB. Stop acquisition with Ion Set #1 and begin acquisition with Ion Set #2 just (approximately 10 seconds) before elution of PCB congener #104, the first eluting Cl_5-PCB. Stop acquisition with Ion Set #2 and begin acquisition with Ion Set #3 just (approximately 10 s) after elution of PCB congener #77, the last eluting Cl_4-PCB. Stop acquisition with Ion Set #3 and begin acquisition with ion Set #4 just (approximately 10 s) after elution of $^{13}C_{12}$-4,4'-DDT.

9.2.4.1.4 SIM data acquisition with five ion sets. Acquire data with the four Ion Sets described in Sect. 9.2.4.1.3 and add a fifth Ion Set beginning data acquisition with that set just (approximately 10 s) before elution of PCB congener #208, the first eluting Cl_9-PCB.

9.2.4.2 SIM Calibration for Pesticide Determinations -- Three sets of ≤15 ions each are used (Tables 9-10). Begin data

acquisition with Ion Set #1 before elution of alpha-BHC, the first eluting pesticide analyte. Begin data acquisition with Ion Set #2 after elation of aldrin and before elution of heptachlor epoxide. Stop acquisition with Ion Set #2 and begin acquisition with Ion Set #3 after elution of endosulfan II and before 4,4'-DDD.

9.2.5 Performance Criteria

9.2.5.1 Full-Range Data from Analysis of Medium CAL

9.2.5.1.1 GC performance -- baseline separation of beta-BHC and gamma-BHC; baseline separation of endrin ketone and chrysene-d_{12}; height of Cl_1-PCB peak $\geq$ 80% beta- BHC peak height; height of chrysene-d_{12} peak $\geq$ 60% of the peak height of methoxychlor, which may partially coelute with the Cl_8-PCB congener.

9.2.5.1.2 MS sensitivity -- Signal/noise ratio of $\geq$5 for m/z 499 of PCB congener #209, Cl_{10}-PCB.

9.2.5.1.3 MS calibration -- Abundance of $\geq$40% and $\leq$60% of m/z 502 relative to m/z 498 for PCB congener #209.

9.2.5.1.4 Lack of degradation of endrin. Examine an extracted ion current profile (EICP) for m/z 67 in the retention time window between 4,4'-DDE and endosulfan sulfate; confirm that the abundance of m/z 67 at the retention time of endrin aldehyde in <10% of the abundance of m/z 67 produced by endrin.

9.2.5.1.5 Lack of degradation of $^{13}C_{12}$-4,4'-DDT. Examine EICPs for m/z 258 and m/z 247 in the retention time window that includes 4,4'-DDD, 4,4'-DDE and 4,4'-DDT; m/z 258 would be produced by $^{13}C_{12}$ -4,4'DDE, and m/z 247 by a $^{13}C_{12}$-4,4'-DDD. Confirm that the total abundance of both-ions is <5% of m/z 247 produced by $^{13}C_{12}$-4,4'-DDT.

9.2.5.2 SIM PCB Data

9.2.5.2.1 GC separation -- Baseline separation of PCB congener #87 from congeners #154 and #77, which may coelute.

9.2.5.2.2 MS sensitivity -- Signal/noise ratio of $\geq$5 for m/z 499 of PCB congener #209, Cl_{10}-PCB, and for m/z 241 of chrysene-d_{12}.

9.2.5.2.3 MS calibration -- Abundance of ≥ 70% and ≤ 95% of m/z 500 relative to m/z 498 for congener #209, Cl_{10}-PCB.

9.2.5.3 SIM Pesticide Data

9.2.5.3.1 GC separation -- Baseline separation of endrin ketone and chrysene-d_{12}; baseline separation of beta-BHC and gamma-BHC; baseline separation of endrin ketone and chrysene-d_{12}; height of chrysene-d_{12} peak ≥ 60% of methoxychlor peak height.

9.2.5.3.2 MS sensitivity -- Signal/noise ratio of >5 for m/z 241 of chrysene-d_{12}.

9.2.5.3.3 MS calibration -- Abundance of m/z 241 relative to that of m/z 240 produced by chrysene-d_{12} is >15% and <25%.

9.2.5.3.4 Lack of degradation of endrin. Examine an SICP for m/z 67 in the retention time window between 4,4'-DDE and endosulfan sulfate; confirm that the abundance of m/z 67 at the retention times of endrin aldehyde is <10% that of m/z 67 produced by endrin.

9.2.5.3.5 Lack of degradation of $^{13}C_{12}$-4,4'-DDT. Examine SICPs for m/z 258 and m/z 247 in the retention time window that includes 4,4'-DDD 4,4'-DDE, and 4,4'-DDT; m/z 258 would be produced by $^{13}C_{12}$-4,4'-DDE, and m/z 247 by $^{13}C_{12}$ -4,4'-DDD. Confirm that the total abundance of both ions is <5% of m/z 247 produced by $^{13}C_{12}$-4,4'-DDT.

9.2.6 Replicate Analyses of CALs -- If all performance criteria are met, analyze one 1- or 2-uL aliquot of each of the other four CALs.

9.2.7 Response Factor Calculation

9.2.7.1 Calculate five response factors (RFs) for each pesticide analyte, PCB calibration congener, and surrogate compound relative to both ISs (See Sect. 12.3-2), phenanthrene-d_{10} and chrysene;-d_{12}:

$$RF = A_x Q_{is} / A_{is} Q_x$$

where A_x = integrated ion abundance of quantitation ion for a pesticide, a PCB calibration congener or a surrogate compound,

A_{is} = integrated ion abundance of m/z 240, the quantitation ion when chrysene-d_{12} is used as the internal standard or m/z 188, the quantitation ion when phenanthrene-d_{10} is used as the internal standard,

Q_{is} = injected quantity of chrysene-d_{12} or phemmthrene-d_{10},

Q_x = injected quantity of pesticide analyte, PCB calibration congener or surrogate compound.

RF is a unitless number, units used to express quantities must be equivalent. Note: The Cl_2-PCB calibration congener may not be resolved from alpha-BHC. If not, alpha-BHC will contribute to the ion abundance measured for $C1_2$-PCB. To correct for this contribution, subtract 6.7% of the ion abundance of m/z 219 measured for alpha-BBC from the ion abundance measured for m/z 222 for Cl_2-PCB.

9.2.8 Response Factor Reproducibility -- For each pesticide analyte, PCB calibration congener and surrogate compound, calculate the mean RF from analyzes of each of the five CALS. When the RSD exceeds 20%, analyze additional aliquots of appropriate CALS to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance.

9.2.9 SIM Analyte Retention Time Reproducibility

9.2.9.1 PCB determinations - Absolute retention times of PCB congeners #77 and #104 should not vary by more than ±10 s from one analysis to the next. (Retention time reproducibility is not as critical for congeners #1 and #209 as for #77 and #104, which are used to determine when ion sets are changed.)

9.2.9.2 Pesticide determinations -- Absolute retention times of gamma-chlordane, endosulfan I, and endosulfan II should not vary by more than ±10 s from one analysis to the next.

9.2.10 Record a spectrum of each CAL component.

9.3 CONTINUING CALIBRATION CHECK

9.3.1 With the following procedures, verify initial calibration at the beginning and end of each 12-h period during which analyses are to be performed.

9.3.2 Calibrate and tune the MS with standards and procedures prescribed by the manufacturer.

9.3.3 Analyze a 1-uL or 2-uL aliquot of the DFTPP solution and ensure acceptable MS calabration and performance (Table 6).

9.3.4 Inject a 1-uL or 2-uL aliquot of the Medium CAL and analyze with the same conditions used during Initial Calibration.

9.3.5 Demonstrate acceptable performance for criteria described in Sect. 9.2.5.

9.3.6 Determine that neither the area measured for m/z 240 for chrysene-d_{12} nor that for m/z 188 for phenanthrene-d_{10} has decreased by more than 30% from the area measured in the most recent previous analysis of a calibration solution or by more than 50% from the mean area measured during initial calibration.

9.3.7 Response Factor Reproducibility -- For an acceptable Continuing Calibration Check, the measured RF for each analyte/surrogate compound must be within ±20% of the mean value calculated (Sect. 9.2.7) during Initial Calibration. If not, remedial action must be taken; recalibration may be necessary.

9.3.8 SIM Analyte Retention Time Reproducibility -- Demonstrate and document acceptable (Sect. 9.2.9) reproducibility of absolute retention times of appropriate pesticide analytes and PCB retention time congeners.

9.3.9 Remedial actions must be taken if criteria are not met; possible remedies are:

9.3.9.1 Check and adjust GC and/or MS operating conditions.

9.3.9.2 Clean or replace injector liner.

9.3.9.3 Flush column with solvent according to manufacturers instructions.

9.3.9.4 Break off a short portion (approximately 0.33 m) of the column; check column performance by analysis of performance check solution.

9.3.9.5 Replace GC column; performance of all initial calibration procedures then required.

9.3.9.6 Adjust MS for greater or lesser resolution.

9.3.9.7 Calibrate MS mass scale.

9.3.9.8 Prepare and analyze new concentration calibration/performance check solution.

9.3.9.9 Prepare new concentration calibration curve(s).

10. QUALITY CONTROL

10.1 LABORATORY REAGENT BLANK (LRB) -- Perform all steps in the analytical procedure (Section 11) using all reagents, standards, surrogate compounds, equipment, apparatus, glassware, and solvents that would be used for a sample analysis; but omit an aliquot of sample (water or soil/sediment). For water samples, substitute 1 L of reagent water. If available, substitute EPA-provided reagent blank solid material for an aliquot of soil/sediment.

10.1.1 An LRB must contain the same amount of surrogate compounds and internal standards that is added to each sample. This amount will vary with sample type and with the type of data acquisition (full-range or SIM).

10.1.2 Analyze an LRB before any samples are extracted and analyzed.

10.1.3 Before a new batch of solvents or reagents is used for sample extraction or for column chromatographic procedures, analyze an LRB. In addition, analyze a laboratory solvent blank (LSB), which is the same an an LRB except that no surrogate compounds or internal standards are added; this demonstrates that reagents contain no impurities producing an ion current above the level of background noise for quantitation ions for those compounds.

10.1.4 Analyze an LRB along with each batch of $\leq$20 samples.

10.1.5 An acceptable LRB contains no method analyte at a concentration greater than one half of its MDL and contains no additional compounds with elution characteristics and mass spectral features that would interfere with identification and measurement of a method analyte at its MDL. If the LRB that was extracted along with a batch of samples is contaminated, the entire batch of samples must be reextracted and reanalyzed.

10.1.6 Corrective action for unacceptable LRB -- Check solvents, reagents, apparatus and glassware to locate and eliminate the source of contamination before any samples are extracted and analyzed. Purify or discard contaminated reagents and solvents.

10.2 CALIBRATION - Included among initial and continuing calibration procedures are numerous quality control checks to ensure that valid data are acquired (See Sect. 9). Continuing calibration checks are accomplished with results from analysis of one

solution, the medium level calibration solution for the appropriate type of data acquisition, either full-range or SIM.

10.2.1 If some criteria are not met for a Continuing Calibration Check after a 12-h period during which samples were analyzed, those samples must be reanalyzed. Those criteria are: GC performance (Sect. 9.2.5), MS calibration as indicated by DFTPP spectrum, and MS sensitivity as indicated by area of internal standards.

10.2.2 When other criteria in seat. 9.2 are not met, results for affected analytes must be labeled as suspect to alert the data user of the observed problem. Included among those criteria are: response factor check for each analyte or PCB calibration congener, degradation of DDT and endrin, and retention time reproducibility for SIM data acquisition.

10.3 INITIAL DEMONSTRATION OF LABORATORY CAPABILITY FOR WATER ANALYSES (Insufficient information is currently available for demonstration for soil/ sediment analyzes.)

10.3.1 Until appropriate Quality Control Check Samples are available, each laboratory should prepare one or more solutions containing each method analyte at a concentration corresponding to that anticipated in samples. Until accuracy and precision limits have been established for PCB isomer groups in appropriate samples, a solution containing an Aroclor mixture may be used; compare total measured PCB concentration to the total Aroclor concentration. Report Aroclor concentration and measured concentrations of PCB isomer groups and total measured PCB concentration.

10.3.2 Add an appropriate volume of a solution of method analytes to each of four 1-L aliquots of reagent water. Extract and analyze according to procedures in Sect. 11.

10.3.3 For each analyte, calculate measured concentrations, relative standard deviation of the four measurements, and method bias (Sect. 12.6).

10.4 LABORATORY PERFORMANCE CHECK SOLUTION -- In this method, the medium level concentration calibration solution also serves the purpose of a laboratory performance check solution.

10.5 LABORATORY SURROGATE SPIKE

10.5.1 Measure the concentration of both surrogate compounds in every sample and blank.

10.5.2 Until performance based acceptance limits have been established for surrogate compounds, the following guidelines are provided: measured bias with LRB = -30% to +10%; measured bias with water or soil/sediment extract = -50% to +25%.

10.6 QUALITY CONTROL CHECK SAMPLE -- Not yet available? anticipate need for analysis of one for each batch of ≤20 samples. If full-range data are acquired, both pesticide and PCB analytes can be determined with one analysis. If SIM data are acquired, one extraction and two GC/MS analyses will be needed to determine both PCBs and pesticides.

10.7 LABORATORY SPIKED DUPLICATE SAMPLE -- Select one sample from each batch of ≤20 samples of similar and fortify (spike) two aliquots of that sample with a solution containing appropriate concentrations of pesticide analytes and at least one Aroclor mixture. After addition of surrogate compounds, extract and analyze (Sect. 11) these two fortified aliquots along with an additional unfortified sample aliquot. Relative difference (RD) of duplicate results for surrogate compound concentrations should be ≤40%. ($RD = [C_1 - C_2 / 0.5 (C_1 + C_2)] 100$) Calculate bias (Sect. 12.6) for each analyte and surrogate compound. Insufficient data are currently available to provide guidance for acceptable bias and RD of measured analyte concentrations.

10.8 PERFORMANCE EVALUATION SAMPLE - Not yet available to be analyzed periodically when available.

11. PROCEDURES

11.1 SAMPLE EXTRACTION

11.1.1 Water Samples

11.1.1.1 Mark the water meniscus on the side of the sample bottle for later determination of sample volume. Pour entire sample into a 2-L separatory funnel. (If a sample larger than 1-L or 1-qt is extracted, the funnel size and solvent volume for samples and blanks must be adjusted also.)

11.1.1.2 Add an appropriate volume of surrogate compound solution.

11.1.1.2 Add 60 mL of methylene chloride to the sample bottle, seal, and shake 30 s to rinse the inner surface. Transfer the solvent to the separatory funnel and extract the sample by shaking the funnel for 2 min with periodic venting to release excess pressure. Wait at least 10 min to allow the organic layer to separate from the water phase. If the emulsion interface between layers is more than one-third the volume of the solvent layer, use mechanical techniques (such as stirring, filtration of emulsion through glass wool, or centrifugation) to complete phase separation. Collect the methylene chloride extract in a 250-mL Erlenmeyer flask. Add a second 60-mL volume of methylene chloride to the sample bottle and repeat the extraction procedure a second time, combining the extracts in the Erlenmeyer flask. Perform a third extraction in the same manner.

11.1.1.3 Assemble a Kurderna-Danish (K-D) concentrator by attaching a 10-mL concentrator tube to a 500-ML evaporative flask.

11.1.1.4 Pour the combined extract into a solvent-rinsed drying column containing about 10 cm of anhydrous sodium sulfate. Rinse the Erlenmeyer flask with a 20 to 30 mL portion of methylene chloride, and add the rinse to the drying column. Collect the combined extract in the K-D concentrator.

11.1.1.5 Add one or two clean boiling chips to the evaporative flask and attach a three-ball Snyder column. Prewet the Snyder column by adding about 1 mL of methylene chloride to the top. Place the K-D apparatus on a hot water bath (60-65°C) so that the concentrator tube is partially immersed in the hot water, and the entire lower rounded surface of the flask is bathed with hot vapor. Adjust the vertical position of the apparatus and the water temperature as required to complete the concentration in 15-20 min. At the proper rate of distillation the balls of the colum will actively chatter but the chambers will not flood with condensed solvent. When the apparent volume of liquid reaches 1 mL, remove the K-D apparatus from the water bath and allow it to drain and cool for at least 10 min.

11.1.1.6 Momentarily remove the Snyder column, add 50 mL of hexane and a new boiling chip, and reattach the Snyder column. Increase the temperature of the hot water bath to about 80°C. Concentrate the extract to approximately 10 mL an in Sect. 11.1.1.5, except use hexane to prewet the column. Elapsed time of concentration should be 5-10 min.

11.1.1.7 Remove the Snyder column and rinse the flask and its lower joint into the concentrator tube with 1-2 mL of hexane. A 5mL syringe is recommended for this operation. Stopper the concentrator tube and store refrigerated if further processing will not be performed within a few hours. If the extract will be stored longer than two days, transfer it to a Teflon-sealed screw-cap vial.

11.1.1.8 Determine the original sample volume by refilling the sample bottle to the mark and transferring the liquid to a 1000-mL graduated cylinder. Record the sample volume to the nearest 5 mL.

11.1.2 Soil/Sediment Samples -- Appropriate extraction procedures to be specified when results of ongoing experiments are obtained.

11.2 Sulfur Removal -- Elemental sulfur can be removed by the procedure described below. (Sulfur is not expected to be a problem in water sample extracts but sulfur removal is recommended for soil/sediment sample extracts.)

11.2.1 Transfer the extract to a 50-mL clear glass bottle or vial with a Teflon-lined screw cap. Rinse the extract container wtih 1.0 mL of hexane, adding the rinse to the 50-mL bottle.

11.2.2 Add 1 mL of Tetrabutylammonium-sulfite reagent and 1 mL 2-propanol, cap the bottle, and shake for at least 1 min. If the sample is colorless or if the initial color is unchanged, and if clear crystals (precipitated sodium sulfits) are observed, sufficient sodium sulfite is present. If the precipitated sodium sulfite disappears, add more crystalline sodium sulfite in approximately 100-mg portions until a solid residue remains after repeated shaking.

11.2.3 Add 5 mL of distilled water and shake for at least 1 min. Allow the sample to stand for 5-10 min and remove the hexane layer (top) for analysis. Dry the extract by passing it through a 10-cm column containing hexane-washed sodium sulfate. Rinse the sodium sulfate with about 30 mL of hexane and add this hexane to the extract. Concentrate the extract to approximately 10 mL with a K-D apparatus. Store in a refrigerator if GC/MS analysis is not to be performed within a few hours.

11.3 GC/MS ANALYSIS

11.3.1 Remove the Sample extract or blank from storage and allow it to warm to ambient laboratory temperature if necessary. With a stream of dry, filtered nitrogen, reduce the extract/blank volume to the appropriate volume, depending on anticipated analyte concentrations. Add an appropriate volume of the appropriate internal standard stock solution.

11.3.1.1 Internal standard concentration for full-range data acquisition = 7.5 ng/uL of extract.

11.3.1.2 Internal standard concentration for SIM data acquisition = 0.75 ng/uL of extract.

11.3.2 Inject a 1-uL or 2-uL aliquot of the blank/sample extract into the GC operated under conditions used to produce acceptable results during calibration.

11.3.3 Acquire mass spectral data with either full-range data acquisition conditions or SIM conditions, as appropriate. Use the same data acquisition time and MS operating conditions previously used to determine response factors.

11.3.4 Examine data for saturated ions in mass spectra of target compounds, if saturation occurred, dilute and reanalyze the extract after the quantity of the internal standards is adjusted appropriately.

11.3.5 For each internal standard, determine that the area measured in the sample extract has not decreased by >30% from the area measured during the most recent previous analysis of a calibration solution or by >50% from the mean area measured during initial calibration. If either criterion is not met, remedial action must be taken to improve sensitivity, and the sample extract must be reanalyzed.

11.4 IDENTIFICATION PROCEDURES

11.4.1 Using the ions shown in Tables 7a-7c for PCBs or Table 9 for pesticides, examine ion current profiles (ICPs) to locate internal standards, surrogate compounds, pesticide analytes, and PCBs for each isomer group. Use the RRT data in Table 9 as guidelines for location of pesticide analytes and the RRT window data in Table 8 an guidelines for location of PCB isomers. (A reverse search software routine can be used to locate compounds of concern.)

11.4.2 Full-Range Data

11.4.2.1 Examine each pesticide and PCB candidate spectrum after background correction routines have been applied. Compare the candidate spectrum with the appropriate standard spectrum measured during calibration. Verify the absence of any ions with mass greater than the highest mass possible for the compound of concern. (Ions in PCB M^+ ion clusters are shown in Table 12.)

11.4.2.2 Obtain integrated abundance areas for quantitation and confirmation ions.

11.4.3 SIM Data -- Obtain appropriate selected ion current profiles (SICPs) for IS quantitation and confirmation ions, for each ion monitored to detect pesticides and the surrogate compounds (Table 9), and for the quantitation and confirmation ions for each PCB isomer group.

11.4.4 PCB Analytes

11.4.4.1 For all PCB candidates, confirm the presence of an $(M-70)^+$ ion cluster by examining ICPs or spectra for at least one of the most intense ions in the appropriate ion cluster.

11.4.4.2 For Cl_3-Cl_7 isomer groups, examine ICPs or spectra for intense $(M+70)^+$ ions that would indicate a coeluting PCB containing two additional chlorines. (GC retention time data show that this is not a potential problem for other PCB isomer groups; see Figure 2.) If this interference occurs, a correction can be made. Obtain and record the area for the appropriate ion (Table 12) for the candidate PCB isomer group. Use the information in Table 13 to correct the measured abundance of M^+. For example, if a Cl_7-PCB and a Cl_5-

PCB candidate coelute, the Cl_7-PCB will contribute to the ion measured for m/z 326 and m/z 324, the quantitation and confirmation ions, respectively, for a Cl_5-PCB. Obtain and record the area for m/z 322 (the lowest mass ion in the $(M+-70)^+$ ion cluster of a Cl_5-PCB fragment produced by a Cl_7-PCB). To determine the m/z 326 and m/z 324 areas produced by the Cl_5 PCB, calculate the Cl_7-PCB contribution to each and subtract it from the measured area. In this example, 164% of the area measured for m/z 322 should be subtracted from the area measured for m/z 324, and 108% of the m/z 322 area should be subtracted from the area measured for m/z 326 (Table 13).

11.4.4.3 For Cl_2-Cl_8-PCB candidates, examine ICPs or spectra for intense $(M+35)^+$ ions that would indicate a coeluting PCB containing one additional chlorine. This coelution causes interferences because of the natural abundance of ^{13}C. (This interference will be small and can be neglected except when measuring the area of a small amount of a PCB coeluting with a large amount of another PCB containing one more chlorine.) To correct for this interference, obtain and record the area for the appropriate ion (Table 14) from the $(M-1)^+$ ion cluster, and subtract 13.5% of the area masured for the $(M-1)^+$ ion fron the measured area of the qcantitation ion. For example, for Cl_5-PCB candidates, obtain and record the area for m/z 325; subtract 13.5% of that area from the measured area of m/z 326.

11.4.5 All Analytes -- Use ICP data to calculate the ratio of the measured peak areas of the quantitation ion and confirmation ion(s), and compare to the acceptable ratio (Table 9 for pesticides and Table 12 for PCBs). If acceptable ratios are not obtained, a coeluting or partially coeluting compound may be interfering. Examination of data from several scans may provide information that will allow application of additional background corrections to improve the ion ratio.

11.5 IDENTIFICATION CRITERIA

11.5.1 Internal Standards

11.5.1.1 Chrysene-d_{12} -- the abundance of m/z 241 relative to m/z 240 must be $\geq$15% and $\leq$25%, and these ions must maximize simultaneously. The area measured for m/z 240 must be within 30% of the area measured during the most recent calibration.

11.5.1.2 Phenanthrene-d_{10} -- the abundance of m/z 189 relative to m/z 188 must be $\geq$10% and $\leq$22%, and these ions must maximize simultaneously. The area measured for m/z 188 must be within 30% of the area measured during the most recent acceptable calibration.

11.5.1.3 Retention time must be within ±10 s of that observed during the most recent acceptable calibration.

11.5.2 Full-Range Data for Pesticide Analytes and Surrogate Compounds

11.5.2.1 Retention time of the sample component must be within $\underline{t}$ s of the time observed for that same compound when a calibration solution was analyzed. Calculate the value of $\underline{t}$ with the equation, $t = (RT)^{1/3}$, where RT = observed retention time (in seconds) of the compound during the last previous acceptable calibration.

11.5.2.2 All ions with relative abundance >10% in the mass spectrum must be present in the mass spectrum of the candidate sample component; a molecular ion with relative abundance >2% in the standard spectrum must be present in the candidate spectrum.

11.5.2.3 The ion that was the most abundant (base peak) in the standard spectrum must also be the base peak in the candidate spectrum.

11.5.2.4 For all ions with relative abundance >20% in the standard spectrum, the relative abundance in the candidate spectrum must not vary by more than ±15% in percentage units (i.e., if 50% in standard, must be $\geq$35% and $\leq$65%).

11.5.2.5 Ions with relative abundance >10% in the candidate spectrum but not present in the standard spectrum must be considered and accounted for by the analyst. When data processing software is used to obtain candidate spectra, both processed and unprocessed spectra must be evaluated.

11.5.3 SIM Data for Pesticide Analytes and Surrogate Compounds

11.5.3.1 Absolute retention time of each surrogate compound and pesticide candidate must be within 10 s of that measured during the last previous acceptable calibration.

11.5.3.2 All ions monitored for each compound (Table 9) must be present and must maximize simultaneously.

11.5.3.3 In a spectrum averaged across a GC peak and with background correction, if necessary, the most abundant ion must correlate with Table 9 data.

11.5.3.4 Observed relative abundances of the monitored ions must meet the following criteria:

Aldrin -- m/z 263 = >20% and m/z 265 = >13%
BHC (each isomer) -- m/z 183 = 70-95% of m/z 181
$^{13}C_6$ - gamma-BHC -- m/z 189 = 75-90% of m/z 187
Chlordane (alpha and gamma) -- m/z 375 = 75-99%
4,4'-DEE -- m/z 248 = 45-85%
4 4'-DDD and 4,4'-DDT -- m/z 237 = 45-85%
$^{13}C_{12}$-4, 4' - DDT -- m/z 249 = 45-85%
Dieldrin -- m/z 263 = >3% and m/z 108 = >8%
Endosulfan I and II -- m/z 339 = >30% and m/z 341 = >20%
Endosulfan sulfate -- m/z 274 = 60-95%
Endrin -- m/z 263 = ≥50%
Endrin aldehyde -- m/z 345 = ≥10%
Endrin ketone -- m/z 317 = ≥30%
Heptachlor -- m/z 272 = >30% and m/z 274 = >20%
Heptachlor epoxide -- m/z 353 = >60%
Methoxychlor -- m/z 228 = 3-30%
Nonachlor -- m/z 407 = 65-95%

11.5.4 Full-Range and SIM Data for PCBs

11.5.4.1 Absolute retention times of surrogate compounds must be within ±10 s of that measured during the last previous continuing calibration check.

11.5.4.2 Quantitation and confirmation ions for each PCB isomer group must maximize within ±1 scan of each other.

11.5.4.3 The integrated ion current for each quantitation and confirmation ion must be at least three times background noise and must not have saturated the detector.

11.5.4.4 For each PCB isomer group candidate, the ratio of the quantitation ion area to the confirmation ion area must be within limits shown in Table 12; at least one ion in the $(M-70)^+$ ion cluster most be present.

12. CALCULATIONS

12.1 From appropriate ICPs of quantitation ions, obtain and record the spectrum number of the chromatographic peak apex and the area of the entire chromatographic peak.

12.2 For PCBs, sum the areas for all isomers identified at each level of chlorination (e.g., sum all quantitation ion areas for Cl_4-PCBs).

12.3 Calculate the concentration of each surrogate compound, pesticide candidate, and PCB isomer group using the formula:

$$C_x = (A_x \cdot Q_{is})/(A_{is} \cdot RF \cdot W)$$

where C_x = concentration (micrograms per kilogram or micrograms per liter) of surrogate compound, individual pesticide or a PCB isomer groups,

A_x = the area of the quantitation ion for each pesticide analyte/ surrogate compound or the sum of quantitation ion areas for all PCB isomers at a particular level of chlorination,

A_{is} = the area of the internal standard quantitation ion, m/z 240 for chrysene-d_{12} or m/z 188 for phenanthrene-d_{10},

Q_{is} = quantity (micrograms) of internal standard added to the extract before GC/MS analysis,

RF = calculated response factor for the surrogate compound, the pesticide standard, or the PCB calibration compound for the isomer group (level of chlorination), and

W = weight (kilograms) of sample extracted. If a liquid sample was extracted, W becomes V, the volume (liters) of water extracted, and concentration units become micrograms per liter.

12.3.1 Use the grand mean RF calculated during Initial Calibration.
CAUTION: For PCB analyses with automated data interpretation a linear fit algorithm will produce erroneous concentration data.

12.3.2 For pesticides eluting before heptachlor epoxide, use the RF relative to phenanthrone-d_{10}; for heptachlor expoxide and later eluting pesticides, use the RF relative to chrysene-d_{12}. For PCBs, use the RF relative to chrysene-d_{12} unless an interference makes the use of the RF relative to phenanthrone-d_{10} necessary.

12.4 Estimation of the Concentration of Technical Chlordane. Technical chlordane is a mixture that contains alpha-chlordane (about 13% by weight), gamma-chlordane (about 18% by weight), heptachlor (about 8%), chlordene (three isomers; about 19%) and a variety of side reaction products (including nonachlor isomers) from chlorination of chlordene. Alpha-chlordane is readily converted to gamma-chlordane, which is persistent in environmental samples. Another persistent component in trans-nonachlor. The presence of chlordane and trans-nonachlor, with or without alpha-chlordane and heptachlor) indicates that technical chlordans was once present in the sample. Therefore the sum of measured concentrations of alpha-chlordane and chlordane can be used to estimate the original concentration of technical chlordane.

$$C_{tc} = (C_a + C_g)/0.31$$

where C_a = measured concentration of alpha-chlordane,
C_g = measured concentration of gamma-chlordane, and
C_{tc} = estimated concentration of technical chlordane.

12.5 Report calculated values to two significant figures.

12.6 When samples of known composition or fortified samples are analyzed, calculate the percent method bias using the equation:

$$B = 100 (C_s - C_t)/ C_t$$

where C_s = measured concentration (in micrograms per kilogram or micrograms per liter),
C_t = theoretical concentration (i.e., the quantity added to the sample aliquot/weight or volume of sample aliquot).

Note: The bias value retains a positive or negative sign.

13. AUTOMATED IDENTIFICATION AND MEASUREMENT

Special software can be used for automated identification and measurement of PCBs (8) and pesticides. Unprocessed GC/MS data are handled without human interaction with the software operating on the dedicated computer. A concentration for each pesticide and each PCB isomer group is calculated automatically. Contact EMSL-Cincinnati for further information.

14. METHOD PERFORMANCE

To obtain single laboratory accuracy and precision data for method analytes, replicate 1-L aliquots of reagent water and river water fortified with known amounts of analytes were extracted and analyzed. Automated procedures were used to identify and measure method analytes in 2-uL aliquots of 1-mL extracts. Because a sufficient quantity of individual PCB congeners was not available, Aroclor mixtures were used to fortify water samples. This is not desirable, because individual PCBs in Aroclors vary in concentration. As Aroclor concentrations decrease in a sample extract, an increasing number of components will fall below the detection limit and will not be identified and measured. In addition, insufficient data are available about Aroclor composition to assess accuracy of isomer group measurements or to assess MDLs for PCBs when Araclors are used to fortify samples.

14.1 Medium Level Reagent Water Extracts -- Five aliquots of reagent water fortified with each individual pesticide at a concentration of 10 ug/L and Aroclors 1221, 1242, 1254, and 1268 at concentrations of 5 ug/L, 50 ug/L, 50 ug/L and 25 ug/L, respectively, were extracted and analyzed. Method bias for individual pesticides ranged from -10% to

+18% with a mean method bias of +2% for all 21 pesticides (Table 15). For individual pesticides, RSDs of measured concentration ranged from 0.61% for endrin ketone to 9.8% for endrin aldehyde. No true values are known for concentrations of PCB isomer groups in Aroclors, but the mean measured total PCB concentration was 110 ug/L (RSD 2.9%), which indicated a method bias of -15%. For individual isomer groups, RSDs of mean measured concentrations ranged from 3.9% to 16%.

14.2 Low Level Reagent Water Extract -- Reagent water was fortified with each pesticide at a concentration of 3 ug/L and a total PCB concentration of 27 ug/L (Aroclors 1221, 1 ug/L; 1242, 10 ug/L; 1254, 10 uq/L; and 1268, 6 ug/L). When seven replicate extracts were analyzed, method bias for individual pesticides ranged from -17% to +20% with a mean method bias of -2% (Table 15). An MDL was calculated for each pesticide using the equation relating the standard deviation of the seven replicate measurement and Student's t value for a one-tailed test at the 99% confidence level with n-1 degrees of freedom (1). With this calculation, MDL is defined as the minimum concentration that can be measured and reported with 99% confidence that the value is above zero. The excellent precision achieved with these measurements resulted in unrealistically low MDLs ranging from 0.2 to 0.8 ug/L for pesticide analytes (Table 15). A PCB MDL is an individual congener characteristic and cannot be determined with samples fortified with Aroclor mixtures. Estimates of MDLs for individual components of PCB isomer groups were obtained by proportioning the total quantity measured for each isomer group among individual measured isomers. The estimated MDL values for individual PCBs also were unrealistically low (0.01-0.1 ug/L) because of the excellent precision of measurements. A more realistic statement of detection limits for pesticides and PCBs can be found in Sect. 1.2.

14.3 River Water Extracts -- Five aliquots of river water fortified with each pesticide at a concentration of 5 ug/L and total PCB concentration of 70 ug/L (Aroclors 1221, 2 ug/L; 1242, 30 ug/L; 1254, 30 ug/L; and 1268, 8 ug/L) were extracted and analyzed. Method bias for individual pesticides ranged from -30% to +8% with a mean of -8 % (Table 15). The excellent precision of measured pesticide PCB isomer group concentrations was indicated by RSDs ranging from 1.6% to 7.5%. The mean measured total PCB concentration of 51 ug/L (RSD 2.5%) indicated a method bias of -27 %.

15. REFERENCES

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Table 1. Recommended GC Operating Conditions

Column Type:	SE-54 or DB-5
Film Thickness:	0.25 um
Column Dimensions:	30 m X 0.32 mm
Helium Linear Velocity:	28-29 cm/sec at 250°C
Temperature Program for Splitless Injection:	
o Full-range data acquisition for PCBs and pesticides (Analysis time = approx. 50 min.)	Inject at 80°C and hold 1 min; increase at 30°/min to 160°C and hold 1 min; increase at 3°/min to 310°C. or Inject at 80°C and hold 1 min; heat rapidly to 160°C and hold 1 min; increase at 10°/min to 310°C.
o SIM data acquisition for PCBs (Analysis time - approx. 25 min)	Inject at 45°C and hold 1 min; increase at 20°/min to 150°C and hold 1 min; increase at 10°/min to 310°C.
o SIM data acquisition for pesticides (Analysis time - approx. 30 min)	Inject at 80°C and hold 1 min; increase at 30°/min to 160°C and hold 1 min; increase at 3°/min to 250°C; hold past elution time of methoxychlor.

Table 2. PCB Congeners Used as Calibration Standards

PCB Isomer Group	Congener Number[a]	Chlorine Substitution
Concentration Calibration Standard		
Monochlorobiphenyl	1	2
Dichlorobiphenyl	5	2, 3
Trichlorobiphenyl	29	2, 4, 5
Tetrachlorobiphenyl	50	2, 2', 4, 6
Pentachlorobiphenyl	87	2, 2', 3, 4, 5'
Hexachlorobiphenyl	154	2, 2', 4, 4', 5, 6'
Heptachlorobiphenyl	188	2, 2', 3, 4', 5, 6, 6'
Octachlorobiphenyl	200	2, 2', 3, 3', 4, 5', 6, 6'
Nonachlorobiphenyl[b]	-	---
Decachlorobiphenyl	209	2, 2', 3, 3', 4, 4', 5, 5', 6, 6'
Retention Time Calibration Standards		
Tetrachlorobiphenyl	77	3, 3', 4, 4'
Pentachlorobiphenyl	104	2, 2', 4, 6, 6'
Nonachlorobiphenyl	208	2, 2', 3, 3', 4, 5, 5', 6, 7'

[a] Numbered according to the system of Ballschmiter and Zell (2).

[b] Decachlorobiphenyl is used as the calibration congener for both nona- and decachlorobiphenyl isomer groups.

Table 3. Scheme for Preparation of PCB Primary Dilution Standard

PCB Cong.	Isomer Group	Stock Sol. Conc. mg/mL	Proportion for Primary Dil. Sol.	Primary Dil. Std. Conc. ng/uL
#1	Cl_1	1.0	1 part	50
#5	Cl_2	1.0	1 part	50
#29	Cl_3	1.0	1 part	50
#50	Cl_4	1.0	2 parts	100
#87	Cl_5	1.0	2 parts	100
#154	Cl_6	1.0	2 parts	100
#188	Cl_7	1.0	3 parts	150
#200	Cl_8	1.0	3 parts	150
#209	Cl_{10}	1.0	5 parts	250
			Total 20 parts	

Table 4. Composition and Approximate Concentrations of Calibration Solutions for Full-Range Data Acquisition

Analyte/Int. Std./	Concentration (ng/uL)				
Surrogate Compound	**CAL 1**	**CAL 2**	**CAL 3**	**CAL 4**	**CAL 5**
PCB Cal. Congeners					
Cl_1 (#1)	0.5	2.5	5	10	25
Cl_2 (#5)	0.5	2.5	5	10	25
Cl_3 (#29)	0.5	2.5	5	10	25
Cl_4 (#50)	1	5	10	20	50
Cl_5 (#87)	1	5	10	20	50
Cl_6 (#154)	1	5	10	20	50
Cl_7 (#188)	1.5	7.5	15	30	75
Cl_8 (#200)	1.5	7.5	15	30	75
Cl_{10} (#209)	2.5	12.5	25	50	125
Pesticides					
Aldrin	1	5	10	20	50
BHC, each isomer	1	5	10	20	50
Chlordane, each isomer	1	5	10	20	50
4,4'-DDD	1	5	10	20	50
4,4'-DDE	1	5	10	20	50
4,4'-DDT	1	5	10	20	50
Dieldrin	1	5	10	20	50
Endosulfan I	2	10	20	40	100
Endosulfan II	2	10	20	40	100
Endosulfan Sulfate	2	10	20	40	100
Endrin	1	5	10	20	50
Endrin aldehyde	1	5	--	20	50
Endrin Ketone	1	5	10	20	50
Heptachlor	1	5	10	20	50
Heptachlor epoxide	1	5	10	20	50
Methoxychlor	1	5	10	20	50
Nonachlor, each isomer	1	5	10	20	50
Internal Standards					
Chrysene-d_{12}	7.5	7.5	7.5	7.5	7.5
Phenanthrene-d_{10}	7.5	7.5	7.5	7.5	7.5
Surrogate Compounds					
$^{13}C_6$-gamma BHC	1	5	10	20	50
$^{13}c_{12}$-4,4'-DDT	1	5	10	20	50

Table 5a. Composition and Approximate Concentrations of Calibration Solutions for SIM Data Acquisition for PCB Determinations

	Concentration (ng/uL)				
Compound	**CAL 1**	**CAL 2**	**CAL 3**	**CAL 4**	**CAL 5**
Cal. Congeners					
Cl_1 (#1)	0.1	0.5	1	2	5
Cl_2 (#5)	0.1	0.5	1	2	5
Cl_3 (#29)	0.1	0.5	1	2	5
Cl_4 (#50)	0.2	1.0	2	4	10
Cl_5 (#87)	0.2	1	2	4	10
Cl_6 (#154)	0.2	1	2	4	10
Cl_7 (#188)	0.3	1.5	3	6	15
Cl_8 (#200)	0.3	1.5	3	6	15
Cl_{10} (#209)	0.5	2.5	5	10	25
RT Congeners					
Cl_4 (#77)	0.2	1	2	4	10
Cl_5 (#104)	0.2	1	2	4	10
Cl_9 (#208)	0.4	2	4	8	20
Internal Standards					
Chrysene-d_{12}	0.75	0.75	0.75	0.75	0.75
Phenanthrene-d_{10}	0.75	0.75	0.75	0.75	0.75
Surrogate Compounds					
$^{13}C_6$-gamma BHC	0.2	1	2	4	10
$^{13}c_{12}$-4,4'-DDT	0.2	1	2	4	10

Table 5b. Composition and Approximate Concentrations of Calibration Solutions for SIM Data Acquisition for Pesticide Determinations

Analyte/Int. Std./ Surrogate Compound	Concentration (ng/uL) CAL 1	CAL 2	CAL 3	CAL 4	CAL 5
Pesticide Analytes					
Aldrin	0.2	1	2	5	10
BHC, each isomer	0.2	1	2	5	10
Chlordane, each isomer	0.2	1	2	5	10
4,4'-DDD	0.2	1	2	5	10
4,4'-DDE	0.2	1	2	5	10
4,4'-DDT	0.2	1	2	5	10
Dieldrin	0.2	1	2	5	10
Endosulfan I	0.4	2	4	10	20
Endosulfan II	0.4	2	4	10	20
Endosulfan Sulfate	0.2	1	2	5	10
Endrin	0.2	1	2	5	10
Endrin aldehyde	0.2	1	-	5	10
Endrin Ketone	0.2	1	2	5	10
Heptachlor	0.2	1	2	5	10
Heptachlor epoxide	0.2	1	2	5	10
Methoxychlor	0.2	1	2	5	10
Nonachlor, each isomer	0.2	1	2	5	10
Internal Standards					
Chrysene-d_{12}	0.75	0.75	0.75	0.75	0.75
Phenanthrene-d_{10}	0.75	0.75	0.75	0.75	0.75
Surrogate Compounds					
$^{13}C_6$-gamma BHC	0.2	1	2	5	10
$^{13}C_{12}$-4,4'-DDT	0.2	1	2	5	10

Table 6. Criteria for DFTPP Spectrum

m/z	Relative Abundance
127	40-60%
197	<1%
198	100% (Base Peak)
199	5-9%
275	10-30%
365	>1%
441	Present and <m/z 443
442	>40%
443	17-23% of m/z 442

Table 7a. Ions for Selected Ion Monitoring to Determine PCBs by Acquiring Data for Four Sets of ≤35 Ions Each

PCB Isomer Group/ Int. Std./Surr. Cmpd.	Nominal Mol. Wt.	Mass or Range To be Monitored	No. of Ions	Ion Sets #1	#2	#3	#4
Monochlorobiphenyls	188	152; 186-190	6	6			
Dichlorobiphenyls	222	220-224	5	5			
Trichlorobiphenyls	256	254-260	7	7	7	1[a]	
Tetrachlorobiphenyls	290	288-294	7	7	7	1[b]	
Pentachlorobiphenyls	324	322-328	7		7	7	
Hexachlorobiphenyls	358	356-362	7		6[c]	7	7
Heptachlorobiphenyls	392	390-396	7			6[d]	7
Octachlorobiphenyls	426	424-430	7				7
Nonachlorobiphenyls	460	460-466	7				7
Decachlorobiphenyls	494	496-500	5				5
Chrysene-d_{12}	240	240-241	2				2
Phenanthrene-d_{10}	188	188-189	2	2[e]			
$^{13}C_6$-gamma-BHC	294	187,189	2	2[f]			
$^{13}C_{12}$-4,4'-DDT	364	247;249	2			2	
			Total # Ions	25	27	24	35

[a]Monitor m/z 254 to confirm presence of $(M-70)^+$ for Cl_5-PCBs.

[b]Monitor m/z 288 to confirm presence of $(M-70)^+$ for Cl_6-PCBs.

[c]Begin range at m/z 357 in Ion Set #2.

[d]Begin range at m/z 391 in Ion Set #3.

[e]M/z 188 and 189 included among ions used to detect and measure monochlorobiphenyls.

[f]M/z 187 and 189 included among ions used to detect and measure monochlorobiphenyls.

Table 7b. Ions for Selected Ion Monitoring to Determine PCBs by Acquiring Data for Five Sets of ≤20 Ions Each

Ion Set	Isomer Group/ IS/Surrogate	Quant. Ion	Confirm. Ions	M-70 Ions	M+70 Ions	M+35 Ions	Ion Measured[a] for Correction	
1	Cl_1	188	190	152,153[b]	256,258	222,224	-	-
	Cl_2	222	224	152,153,186,188[c]	290,292,294	256,258	-	221
	Cl_3	256	258	186,188	-	290,292,294	-	225
	Cl_4	292	290,294	220,222	-	-	-	-
	$^{13}C_6$-gamma-BHC	187	189	-	-	-	-	-
	Phenanthrene-d_{10}	188	189	-	-	-	-	-
2	Cl_3	256	258	188,188	324,326,328	290,292,294	254	255
	Cl_4	292	290,294	220,222	360,362	324,326,328	288	289
	Cl_5	326	324,328	254,256,258	-	360,362	-	323
	Cl_6	360	358,362	288,290,292	-	-	-	-
3	Cl_5	326	324,328	254,256	392,394,396,398	360,362	322	323
	Cl_6	360	358, 362	288,290	-	392,394,396,398	-	357
	Cl_7	394	392, 396	322,324,326	-	-	-	-
	$^{13}C_{12}$-4,4'-DDT	247	249	-	-	-	-	-
4	Cl_6	360	358,362	288,290	426,428,430,432	392,394,396	356	357
	Cl_7	394	392,396,398	322,324	-	428,430,432	-	391
	Cl_8	430	428,432	356,358,360	-	-	-	-
	Chrysene-d_{12}	240	241	-	-	-	-	-
5	Cl_8	430	426,428,432	356,358,360	494,496,498,500	462,464,466	-	425
	Cl_9	464	460,462,466	390,392,394	-	496,498,500	-	-
	Cl_{10}	498	494,496,500	424,426,428,430	-	-	-	-

[a]See Tables 12-13.
[b]Cl_1-PCBs lose HCl.
[c] Some Cl_2-PCBs lose Cl_2 and some lose Hcl.

Table 7c. Ions for Selected Ion Monitoring to Determine PCBs by Acquiring Data for Five Ion Sets of ≤20 Ions

Ion Set No. 1[a]	Ion Set No. 2[b]	Ion Set No. 3[c]	Ion Set No. 4[d]	Ion Set No. 5[e]
152	186	247	240	356
153	188	249	241	358
186	220	254	288	360
187	222	256	290	390
188	254	288	322	392
189	255	290	324	394
190	256	322	326	424
220	258	323	356	425
221	288	324	357	426
222	289	326	358	428
224	290	328	360	430
255	292	357	362	432
256	294	358	391	462
258	323	360	392	464
290	324	362	394	466
292	326	392	396	496
294	328	394	398	498
	358	396	428	499
	360	398	430	500
	362		432	502
17 ions	20 ions	19 ions	20 ions	20 ions

[a] Ions to identify and measure Cl_1-Cl_4-PCBs, phenanthrene-d_{10}, and $^{13}C_6$-gamma-BHC.

[b] Ions to identify and measure Cl_3-Cl_6-PCBs.

[c] Ions to identify and measure Cl_5-Cl_7-PCBs and $^{13}C_{12}$-4, 4'-DDT.

[d] Ions to identify and measure Cl_6-Cl_8-PCBs and chrysene-d_{12}.

[e] Ions to identify and measure Cl_8-Cl_{10}-PCBs.

Table 8. Retention Time Data for PCB Isomer Groups and Calibration Congeners

Isomer Group	Approximate RRT Range[a]	Cal. Cong. Number	Cal. Cong. RRT[a]
Monochlorobiphenyls	0.30-0.35	1	0.30
Dichlorobiphenyls	0.38-0.50	5	0.43
Trichlorobiphenyls	0.46-0.64	29	0.54
Tetrachlorobiphenyls	0.55-0.82	50	0.56
Pentachlorobiphenyls	0.64-0.92	87	0.80
Hexachlorobiphenyls	0.75-1.1	154	0.82
Heptachlorobiphenyls	0.88-1.2	188	0.88
Octachlorobiphenyls	0.99-1.21	200	1.03
Nonachlorobiphenyls	1.16-1.28	-	-
Decachlorobiphenyls	1.3	209	1.3

[a] Retention time relative to chrysene-d_{12} with a 30 m X 0.31 mm ID SE-54 fused silica capillary column and the following GC conditions: splitless injection at 80 C hold for 1 min; heat rapidly to 160 C and hold 1 min: increase at 3 C/min to 310 C.

Table 9. Ions for Selected Ion Monitoring Data Acquisition for Pesticide Analytes, Internal Standards and Surrogate Compounds (Ordered by Retention Time)

Ion Set	Analyte/Internal Surrogate Compound	Std/ (MW)	Approx. RRT	Quant. Ion	Ions (Approximate Relative Abundance)
1	Alpha-BHC	(288)	0.43	219	181 (100), 183 (90), 219 (70)
	Beta-BHC	(288)	0.47	219	181 (100), 183 (90), 219 (70)
	Gamma-BHC	(288)	0.48	219	181 (100), 183 (90), 219 (75)
	$^{13}C_6$ -gamma-BHC	(294)	0.48	225	187 (106), 189 (90) 225 (80), 227 (40)
	Phenanthrene-d_{10}	(188)	0.49	188	188 (100), 189 (15)
	Delta-BHC	(288)	0.51	219	181 (100), 183 (90), 219 (70)
	Heptachlor	(370)	0.58	272	100 (100), 272 (60), 274 (40)
	Aldrin	(362)	0.64	263	66 (100), 263 (40), 265 (25)
2	Heptachlor epoxide	(386)	0.70	353	81 (100), 353 (80), 355 (65)
	Gamma-chlordane	(406)	0.74	373	373 (100), 375 (95)
	Endosulfan I	(404)	0.76	195	195 (100), 339 (50), 341 (35)
	Alpha-chlordane	(406)	0.76	373	373 (100), 375 (95)
	Trans-nonachlor	(440)	0.77	409	409 (100), 407 (95)
	Dieldrin	(378)	0.80	79	79 (100), 263 (10), 108 (15)
	4,4'-DDE	(316)	0.81	246	246 (100), 248 (65)
	Endrin	(378)	0.83	81	81 (100), 263 (75)
	Endosulfan II	(404)	0.85	195	195 (100), 339 (50), 341 (35)
3	4,4'-DDD	(318)	0.87	235	235 (100), 237 (65), 165 (65)
	Endrin aldehyde	(378)	0.88	67	67 (100), 345 (30)
	Endosulfan sulfate	(420)	0.92	272	272 (100), 274 (80), 387 (50)
	4,4'-DDT	(352)	0.93	235	235 (100), 237 (65), 165 (65)
	$^{13}C_{12}$ -4,4'-DDT	(364)	0.93	247	247 (100), 249 (65)
	Endrin ketone	(378)	0.99	67	67 (100), 317 (50)
	Chrysene-d_{12}	(240)	1.00	240	240 (100), 241 (20)
	Methoxychlor	(344)	1.03	227	227 (100), 228 (15)

Table 10. Ion Sets for Selected Ion Monitoring of Pesticide Analytes, Internal Standards and Surrogate Compounds (Ordered by Retention Time)

Ion Set No. 1	Monitored Compounds	Ion Set No. 2	Monitored Compounds	Ion Set No. 3	Monitored Compounds
66	Alpha-BHC	79	Heptachlor	67	4,4'-DDD
100	Beta-BHC	81	epoxide	165	Endrin aldehyde
181	Delta-BHC	108	Alpha-chlordane	227	Endosulfan sulfate
183	Gamma-BHC	195	Gamma-chlordane	228	4,4'-DDT
187	$^{13}C_6$-gamma-BHC	246	Endosulfan I	235	$^{13}C_{12}$-4,4'-DDT
188	Phenanthrene-d_{10}	248	Trans-nonachlor	237	Endrin ketone
189	Heptachlor	263	Dieldrin	240	Chrysene-d_{12}
219	Aldrin	339	4,4'-DDE	241	Methoxychlor
225		341	Endrin	247	
227		353	Endosulfan II	249	
263		355		272	
265		373		274	
272		375		317	
274		407		345	
		409		387	
14 ions, 8 compounds		15 ions, 9 compounds		15 ions	8 compounds

Table 11. Known Relative Abundances of Ions in PCB Molecular Ion Clusters[a]

m/z	Relative Intensity
Monochlorobiphenyls	
188	100.00
189	13.50
190	33.40
192	4.41
Dichlorobiphenyls	
222	100.00
223	13.50
224	66.00
225	8.82
226	11.20
227	1.44
Trichlorobiphenyls	
256	100.00
257	13.50
258	98.60
259	13.20
260	32.70
261	4.31
262	3.73
263	0.47
Tetrachlorobiphenyls	
290	76.20
291	10.30
292	100.00
293	13.40
294	49.40
295	6.57
296	11.00
297	1.43
298	0.95
Pentachlorobiphenyls	
324	61.00
325	8.26
326	100.00
327	13.50
328	65.70
329	8.78
330	21.70
331	2.86
332	3.62
333	0.47
334	0.25
Hexachlorobiphenyls	
358	50.90
359	6.89
360	100.00
361	13.50
362	82.00
363	11.00
364	36.00
365	4.77
366	8.92
367	1.17
368	1.20
369	0.15
Hepatachlorobiphenyls	
392	43.70
393	5.91
394	100.00
395	13.50
396	98.30
397	13.20
398	53.80
399	7.16
400	17.70
401	2.34
402	3.52
403	0.46
404	0.40
Octachlorobiphenyls	
426	33.40
427	4.51
428	87.30
429	11.80
430	100.00
431	13.40
432	65.6
433	8.76
434	26.90
435	3.57
436	7.10
437	0.93
438	1.18
439	0.15
440	0.11
Nonachlorobiphenyls	
460	26.00
461	3.51
462	76.40
463	10.30
464	100.00
465	13.40
466	76.40
467	10.20
468	37.60
469	5.00
470	12.40
471	1.63
472	2.72
473	0.35
474	0.39
Decachlorobiphenyl	
494	20.80
495	2.81
496	68.00
497	9.17
498	100.00
499	13.4
500	87.30
501	11.70
502	50.00
503	6.67
504	19.70
505	2.61
506	5.40
507	0.71
508	1.02
509	0.13

[a] Source : Rote and Morris (9)

Table 12. Quantitation, Confirmation, and Interference Check Ions for PCBs, Internal Standards, and Surrogate Compounds

Analyte/ Internal Std.	Nom. MW	Quant. Ion	Confirm. Ion	Expected Ratio[a]	Accept. Ratio[a]	M-70 Confirm. Ion	Interference Check Ions	
							M+70	M+35
PCB Isomer Group								
Cl_1	188	188	190	3.0	2.5-3.5	152[b]	256	222
Cl_2	222	222	224	1.5	1.3-1.7	152	292	256
Cl_3	256	256	258	1.0	0.8-1.2	186	326	290
Cl_4	290	292	290	1.3	1.1-1.5	220	360	326
Cl_5	324	326	324	1.6	1.4-1.8	254	394	360
Cl_6	358	360	362	1.2	1.0-1.4	288	430	394
Cl_7	392	394	396	1.0	0.9-1.2	322	464	430
Cl_8	426	430	428	1.1	0.9-1.3	356	498	464
Cl_9	460	464	466	1.3	1.1-1.5	390	-	498
Cl_{10}	494	498	500	1.1	0.9-1.3	424	-	-
Internal standards								
Chrysene-d_{12}	240	240	241	5.1	4.3-5.9	-	-	-
Phenanthrene-d_{10}	188	188	189	6.6	6.0-7.2	-	-	-
Surrogate compounds								
$^{13}C_6$-gamma-BHC	294	187	189	1.0	0.8-1.2	-	-	-
$^{13}C_{12}$-4,4'-DDT	364	247	249	1.5	1.3-1.7	-	-	-

[a] Ratio of quantitation ion to confirmation ion

[b] Monodichlorobipheyls lose HCl to produce an ion at m/z 152.

Table 13. Correction for Interference of PCB Containing Two Additional Chlorines

Candidate Isomer Group	Quant. Ion	Confirm. Ion	Ion Measured to Determine Interference	% of Meas. Ion Area to be Subtracted from	
				Quant Ion Area	Confirm. Ion Area
Trichlorobiphenyls	256	258	254	99%	33%
Tetrachlorobiphenyls	292	290	288	65%	131%
Pentachlorobiphenyls	326	324	322	108%	164%
Hexachlorobiphenyls	360	362	356	161%	71%
Heptachlorobiphenyls	394	396	390	225%	123%

Table 14. Correction for Interference of PCB Containing One Additional Chlorine

Candidate Isomer Group	Quant. Ion	Ion Measured to Determine Interference	% of Meas. Ion Area to be Subtracted from Quant. Ion Area
Dichlorobiphenyls	222	221	13.5%
Trichlorobiphenyls	256	255	13.5%
Tetrachlorobiphenyls	292	289	17.4%
Pentachlorobiphenyls	326	323	22.0%
Hexachlorobiphenyls	360	357	26.5%
Heptachlorobiphenyls	394	391	30.9%
Octachlorobiphenyls	430	425	40.0%

Table 15. Accuracy and Precision of Automated Measurements of PCBs and Pesticides in Fortified Water Extracts

	Medium Level Reagent Water[a]				Low Level Reagent Water[b]					Ohio River Water[a]			
Analyte (Meas. Ion)	True Conc. ug/L	Mean Meas. Conc., ug/L	(RSD, %)	Bias %	True Conc. ug/L	Mean Meas. Conc., ug/L	(RSD, %)	Bias %	MDL ug/L	True Conc. ug/L	Mean Meas. Conc., ug/L	(RSD, %)	Bias %
Aldrin (263)	10	9.6	(3.6)	-4	3	2.5	(7.2)	-17	0.6	5	4.7	(3.0)	-6
BHC, alpha (219)	10	9.8	(4.3)	-2	3	2.8	(5.0)	-7	0.4	5	4.7	(1.6)	-6
BHC, beta (219)	10	10.5	(3.6)	+5	3	3.0	(2.5)	0	0.2	5	5.1	(2.5)	+2
BHC, gamma (219)	10	10.2	(4.7)	+2	3	2.9	(5.3)	-3	0.5	5	4.8	(3.0)	-4
BHC, delta (219)	10	9.9	(4.2)	-1	3	2.9	(4.8)	-3	0.4	5	4.8	(2.4)	-4
Chlordane, alpha (373)	10	9.6	(3.9)	-4	3	2.9	(4.0)	-3	0.4	5	4.6	(4.2)	-8
Chlordane, gamma (373)	10	9.6	(4.6)	-4	3	2.7	(4.8)	-10	0.4	5	4.4	(3.5)	-12
4,4'-DDD (235)	10	10.4	(3.0)	+4	3	2.9	(3.8)	-3	0.4	5	4.8	(2.5)	-4
4, 4'-DDE (246)	10	9.8	(3.2)	-2	3	2.8	(5.4)	-7	0.5	5	4.5	(4.5)	-10
4,4' -DDT (235)	10	10.9	(3.0)	+9	3	2.9	(4.5)	-3	0.4	5	4.7	(3.9)	-6
Dieldrin (79)	10	10.6	(3.2)	+6	3	2.9	(7.6)	-3	0.7	5	4.5	(4.3)	-10
Endosulfan I (195)	10	9.6	(5.8)	-4	3	3.1	(4.8)	+3	0.5	5	4.4	(5.0)	-12
Endosulfan II (195)	10	10.2	(4.5)	+2	3	3.3	(6.3)	+10	0.7	5	3.5	(4.1)	-30
Endosulfan sulf. (272)	10	10.6	(2.3)	+6	3	3.2	(4.4)	+7	0.4	5	4.8	(1.7)	-4
Endrin (81)	10	11.8	(2.8)	+18	3	3.6	(7.0)	+20	0.8	5	5.4	(7.5)	+8
Endrin aldelhyde (67)	10	9.0	(9.8)	-10	3	2.8	(8.4)	-7	0.7	5	4.4	(4.8)	-12
Endrin ketone (67)	10	11.5	(0.61)	+15	3	3.2	(1.9)	+7	0.2	5	4.7	(3.0)	-6
Heptachlor (272)	10	10.6	(5.1)	+6	3	2.6	(5.3)	-13	0.4	5	4.9	(3.5)	-2
Heptachlor epox. (353)	10	10.0	(2.5)	0	3	3.0	(5.9)	0	0.6	5	4.8	(3.9)	-4
Methoxychlor (227)	10	11.4	(1.6)	+14	3	3.1	(2.3)	+3	0.2	5	4.8	(3.8)	-4
Nonachlor, trans (409)	10	9.5	(4.6)	-5	3	2.8	(2.4)	-7	0.2	5	4.4	(4.3)	-12
All pesticides	10	10.2	(7.1)	+2	3	2.9	(8.6)	-2		5	4.6	(7.7)	-8

Table 15. (Cont.) Accuracy and Precision of Automated Measurements of PCBs and Pesticides in Fortified Water Extracts

Analyte (Meas. Ion)	Medium Level Reagent Water[a]				Low Level Reagent Water[b]					Ohio River Water[a]			
	True Conc. ug/L	Mean Meas. Conc., ug/L (RSD, %)		Mean Bias %	True Conc. ug/L	Mean Meas. Conc., ug/L (RSD, %)		Mean Bias %	Method Detect. Limit	True Conc. ug/L	Mean Meas. Conc., ug/L (RSD, %)		Mean Bias %
PCBs	130	110	(2.9)	-15	27	21.2	(2.8)	-21	c	70	51.3	(2.5)	-27
Cl_1 (188)	-	3.6	(9.9)	-		0.7	(15)	-			1.83	(4.8)	
Cl_2 (222)	-	6.5	(5.7)	-		1.2	(10)	-			3.42	(3.9)	
Cl_3 (256)	-	17.2	(5.3)	-		3.1	(10)	-			10.10	(3.0)	
Cl_4 (292)	-	21.7	(4.1)	-		4.1	(3.8)	-			11.00	(4.5)	
Cl_5 (326)	-	28.8	(3.6)	-		5.6	(2.8)	-			15.40	(3.6)	
Cl_6 (360)	-	9.8	(5.7)	-		1.6	(3.1)	-			4.86	(6.4)	
Cl_7 (394)	-	1.3	(4.3)	-		-	-	-			0.335	(4.8)	
Cl_8 (428)	-	7.1	(3.5)	-		1.6	(2.7)	-			1.56	(4.3)	
Cl_9 (466)	-	12.6	(5.3)	-		2.7	(4.6)	-			3.00	(1.8)	
Cl_{10} (500)	-	2.0	(16.0)	-		0.6	(12)	-			0.442	(1.8)	
Surrogate Compounds													
$^{13}C_6$-gamma-BHC (187)	-	-		-	3	3.0	(3.4)	0	0.3	5	4.9	(1.4)	-2
$^{13}C_{12}$-4, 4'-DDT (247)	-	-		-	-	-	-	-	-	5	4.4	(0.7)	-12

[a] Results of analysis of five replicate extracts of 1-L aliquots of fortified water.

[b] Results of analysis of seven replicate extracts of 1-L aliquots of fortified water.

[c] PCB method detection limits cannot be determined because Arcoclor mixtures were used to fortify samples.

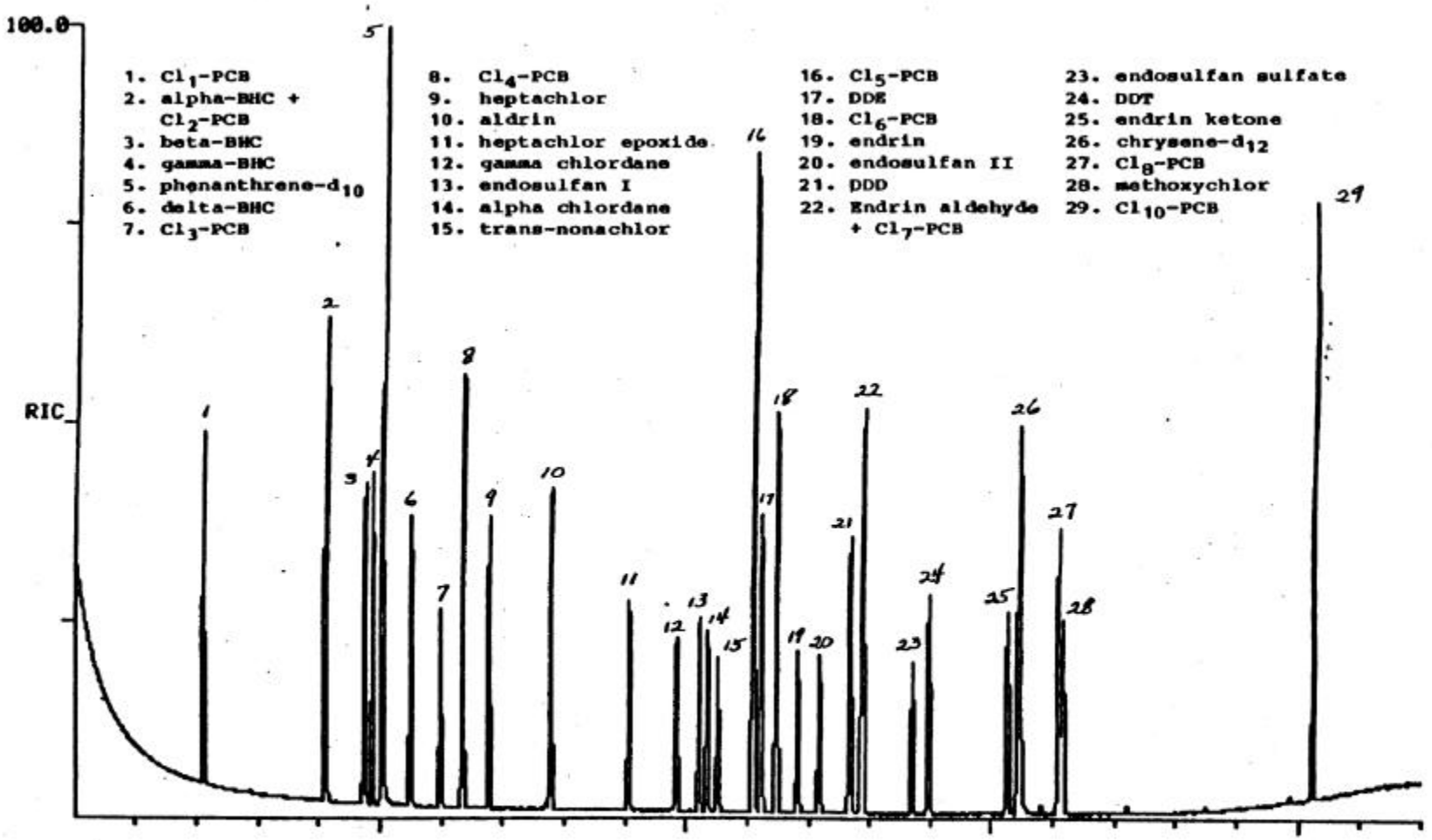


Figure 1. Total Ion Current Profile of PCB Calibration Congeners and Pesticide Analytes.

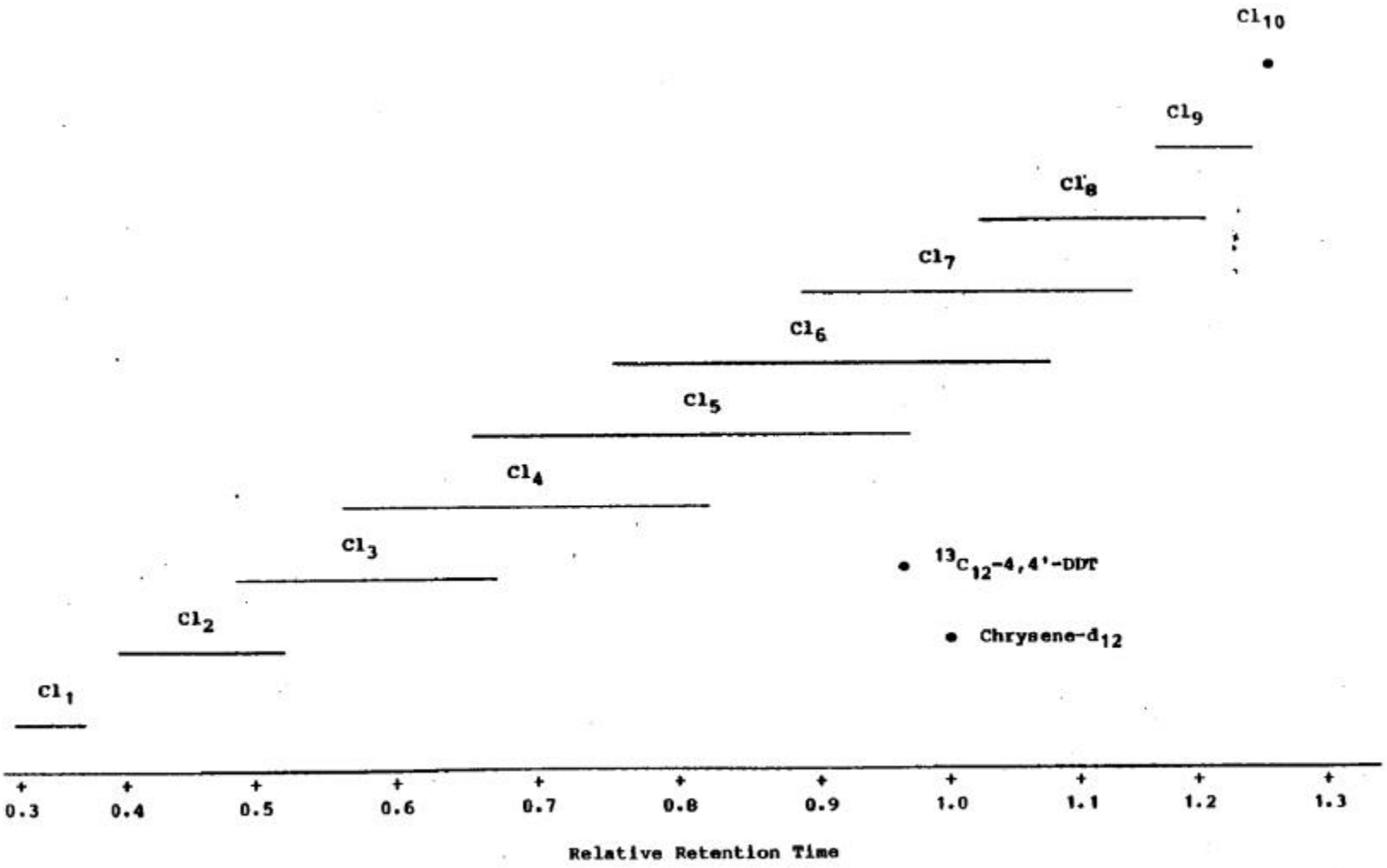


Figure 2. Diagram indicating approximate relative retention times (DB-5 GC column; chrysene-d_{12} internal standard) of PCB isomer groups and retention time marker compounds (for PCB SIM data acquistion option).

Crystal Ball Report
Simulation started on 11/30/01 at 9:52:23
Simulation stopped on 11/30/01 at 10:40:30

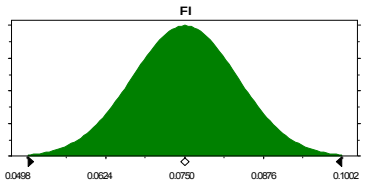
Assumptions

Assumption: FI

Normal distribution with parameters:

Mean	0.0750
Standard Dev.	0.0084

Selected range is from 0.0500 to 0.1000
Mean value in simulation was 0.0750

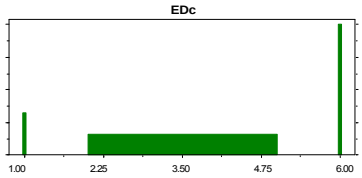


Assumption: Edc

Custom distribution with parameters:

				Relative Prob.
Single point	1.00			0.180000
Continuous range	2.00	to	5.00	0.270000
Single point	6.00			0.550000
Total Relative Probability				1.000000

Mean value in simulation was 4.44

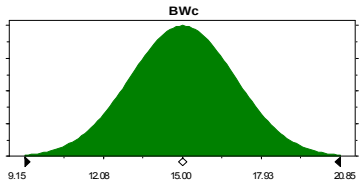


Assumption: BWc

Normal distribution with parameters:

Mean	15.00
Standard Dev.	1.95

Selected range is from 3.00 to 32.00
Mean value in simulation was 15.01



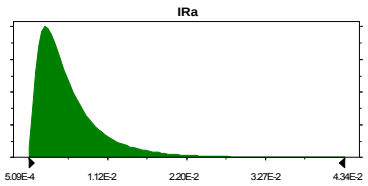
Appendix E - Parameter Probabilistic Distribution Functions Used in Monte Carlo Simulations

Assumption: IRa

Lognormal distribution with parameters:

Geometric Mean	4.70E-03
95% - tile	1.59E-02

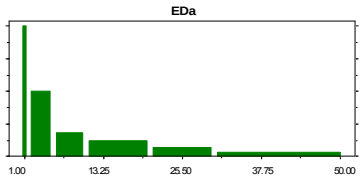
Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 6.08E-3



Assumption: EDa

Custom distribution with parameters:				Relative Prob.
Single point	1.00			0.180000
Continuous range	2.00	to	5.00	0.270000
Continuous range	6.00	to	10.00	0.130000
Continuous range	11.00	to	20.00	0.200000
Continuous range	21.00	to	30.00	0.110000
Continuous range	31.00	to	50.00	0.110000
Total Relative Probability				1.000000

Mean value in simulation was 12.64

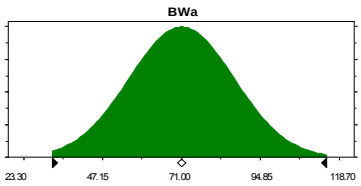


Assumption: BWa

Normal distribution with parameters:

Mean	71.00
Standard Dev.	15.90

Selected range is from 32.00 to 115.00
Mean value in simulation was 71.02

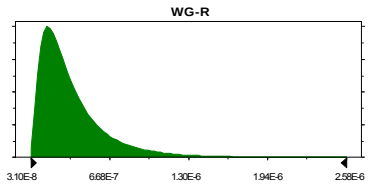


Assumption: WG-R Total Monochlorobiphenyl

Lognormal distribution with parameters:

Mean	3.71E-07
Standard Dev.	3.15E-07

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.64E-7

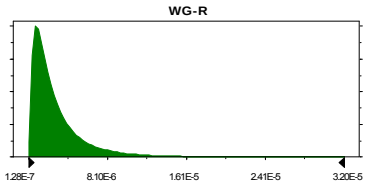


Assumption: WG-R Total Dichlorobiphenyl

Lognormal distribution with parameters:

Mean	3.09E-06
Standard Dev.	3.57E-06

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.08E-6

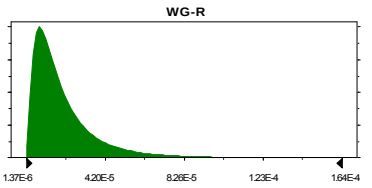


Assumption: WG-R Total Trichlorobiphenyl

Lognormal distribution with parameters:

Mean	2.06E-05
Standard Dev.	1.94E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.06E-5

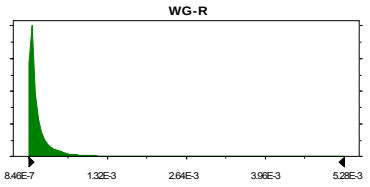


Assumption: WG-R Total Tetrachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.93E-04
Standard Dev.	5.23E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.92E-4

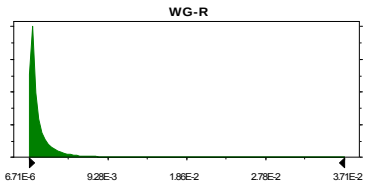


Assumption: WG-R Total Pentachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.40E-03
Standard Dev.	3.67E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.38E-3

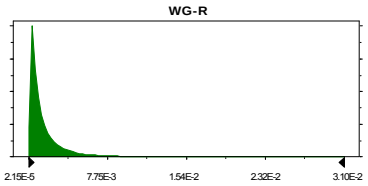


Assumption: WG-R Total Hexachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.70E-03
Standard Dev.	3.11E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.68E-3

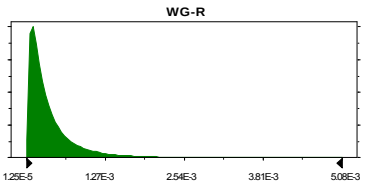


Assumption: WG-R Total Heptachlorobiphenyl

Lognormal distribution with parameters:

Mean	4.16E-04
Standard Dev.	5.46E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 4.17E-4

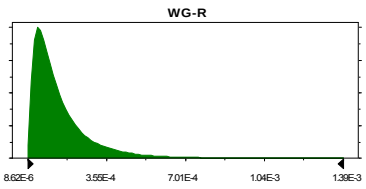


Assumption: WG-R Total Octachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.57E-04
Standard Dev.	1.61E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.58E-4

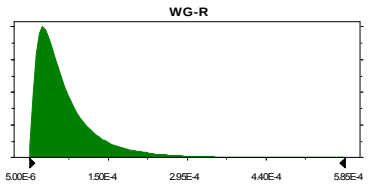


Assumption: WG-R Total Nonachlorobiphenyl

Lognormal distribution with parameters:

Mean	7.41E-05
Standard Dev.	6.94E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 7.37E-5

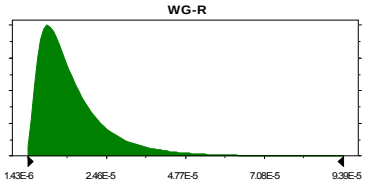


Assumption: WG-R 209-Decachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.48E-05
Standard Dev.	1.17E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.48E-5

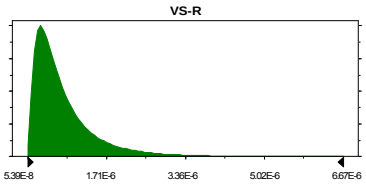


Assumption: VS-R Total Monochlorobiphenyl

Lognormal distribution with parameters:

Mean	8.28E-07
Standard Dev.	7.88E-07

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 8.35E-7

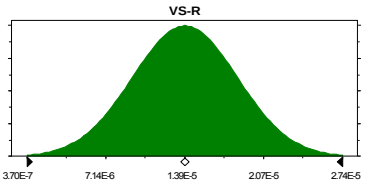


Assumption: VS-R Total Dichlorobiphenyl

Normal distribution with parameters:

Mean	1.39E-05
Standard Dev.	4.51E-06

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.38E-5

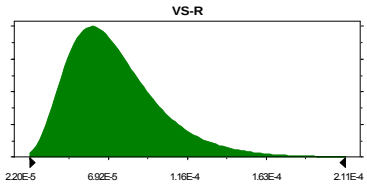


Assumption: VS-R Total Trichlorobiphenyl

Lognormal distribution with parameters:

Mean	7.31E-05
Standard Dev.	2.85E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 7.30E-5

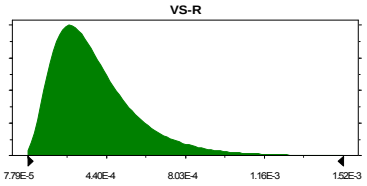


Assumption: VS-R Total Tetrachlorobiphenyl

Lognormal distribution with parameters:

Mean	3.90E-04
Standard Dev.	2.06E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.86E-4

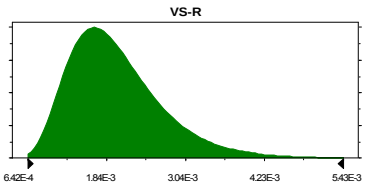


Assumption: VS-R Total Pentachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.99E-03
Standard Dev.	7.31E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.99E-3

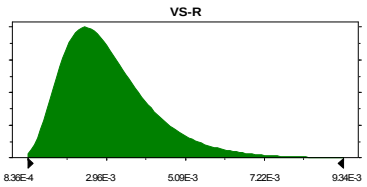


Assumption: VS-R Total Hexachlorobiphenyl

Lognormal distribution with parameters:

Mean	3.03E-03
Standard Dev.	1.27E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.02E-3

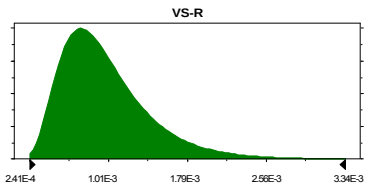


Assumption: VS-R Total Heptachlorobiphenyl

Lognormal distribution with parameters:

Mean	9.88E-04
Standard Dev.	4.54E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 9.88E-4

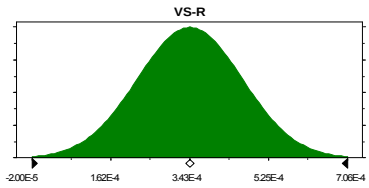


Assumption: VS-R Total Octachlorobiphenyl

Normal distribution with parameters:

Mean	3.43E-04
Standard Dev.	1.21E-04

Selected range is from -Infinity to +Infinity
Mean value in simulation was 3.43E-4

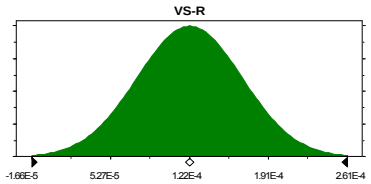


Assumption: VS-R Total Nonachlorobiphenyl

Normal distribution with parameters:

Mean	1.22E-04
Standard Dev.	4.62E-05

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.21E-4

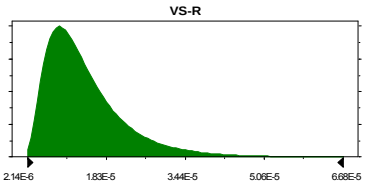


Assumption: VS-R 209-Decachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.41E-05
Standard Dev.	8.79E-06

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.39E-5

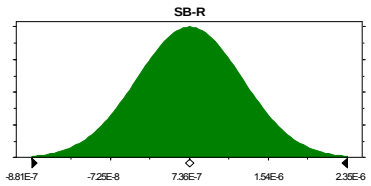


Assumption: SB-R Total Monochlorobiphenyl

Normal distribution with parameters:

Mean	7.36E-07
Standard Dev.	5.39E-07

Selected range is from -Infinity to +Infinity
Mean value in simulation was 7.41E-7

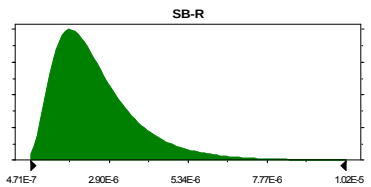


Assumption: SB-R Total Dichlorobiphenyl

Lognormal distribution with parameters:

Mean	2.50E-06
Standard Dev.	1.37E-06

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.50E-6

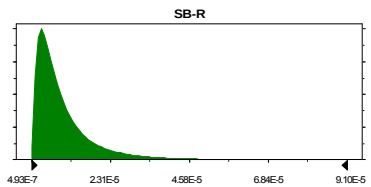


Assumption: SB-R Total Trichlorobiphenyl

Lognormal distribution with parameters:

Mean	9.78E-06
Standard Dev.	1.04E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 9.56E-6

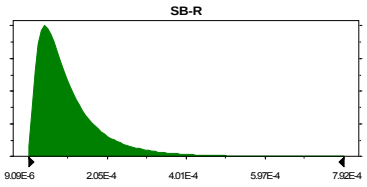


Assumption: SB-R Total Tetrachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.12E-04
Standard Dev.	9.64E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.11E-4

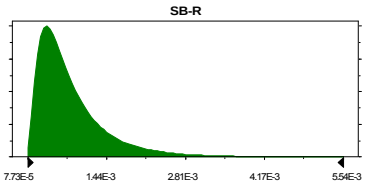


Assumption: SB-R Total Pentachlorobiphenyl

Lognormal distribution with parameters:

Mean	8.43E-04
Standard Dev.	6.85E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 8.34E-4

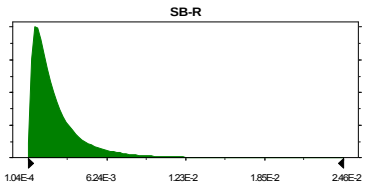


Assumption: SB-R Total Hexachlorobiphenyl

Lognormal distribution with parameters:

Mean	2.43E-03
Standard Dev.	2.76E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.41E-3

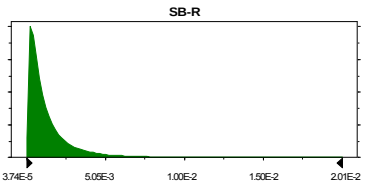


Assumption: SB-R Total Heptachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.50E-03
Standard Dev.	2.12E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.50E-3

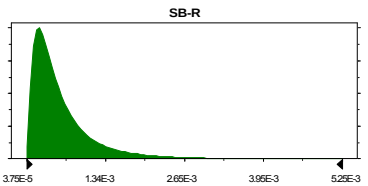


Assumption: SB-R Total Octachlorobiphenyl

Lognormal distribution with parameters:

Mean	6.23E-04
Standard Dev.	6.14E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 6.16E-4

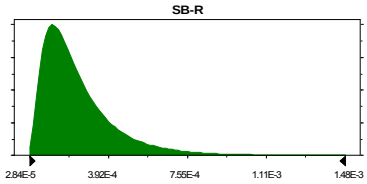


Assumption: SB-R Total Nonachlorobiphenyl

Lognormal distribution with parameters:

Mean	2.55E-04
Standard Dev.	1.88E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.53E-4

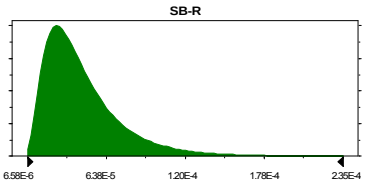


Assumption: SB-R 209-Decachlorobiphenyl

Lognormal distribution with parameters:

Mean	4.70E-05
Standard Dev.	3.07E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 4.66E-5

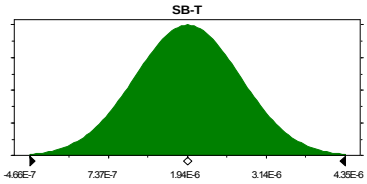


Assumption: SB-T Total Monochlorobiphenyl

Normal distribution with parameters:

Mean	1.94E-06
Standard Dev.	8.02E-07

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.95E-6

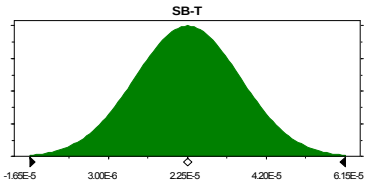


Assumption: SB-T Total Dichlorobiphenyl

Normal distribution with parameters:

Mean	2.25E-05
Standard Dev.	1.30E-05

Selected range is from -Infinity to +Infinity
Mean value in simulation was 2.24E-5

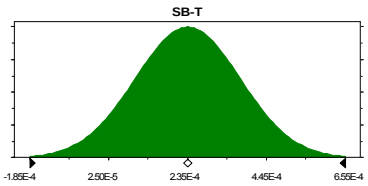


Assumption: SB-T Total Trichlorobiphenyl

Normal distribution with parameters:

Mean	2.35E-04
Standard Dev.	1.40E-04

Selected range is from -Infinity to +Infinity
Mean value in simulation was 2.35E-4

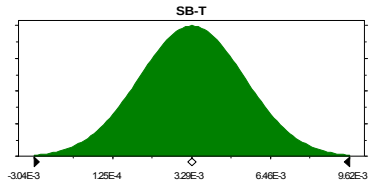


Assumption: SB-T Total Tetrachlorobiphenyl

Normal distribution with parameters:

Mean	3.29E-03
Standard Dev.	2.11E-03

Selected range is from -Infinity to +Infinity
Mean value in simulation was 3.28E-3

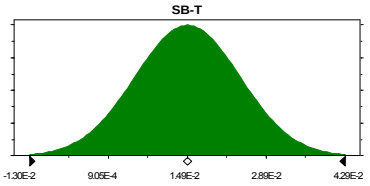


Assumption: SB-T Total Pentachlorobiphenyl

Normal distribution with parameters:

Mean	1.49E-02
Standard Dev.	9.33E-03

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.47E-2

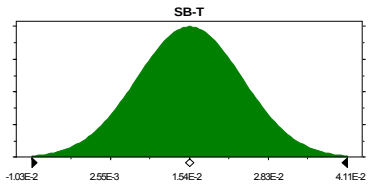


Assumption: SB-T Total Hexachlorobiphenyl

Normal distribution with parameters:

Mean	1.54E-02
Standard Dev.	8.57E-03

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.53E-2

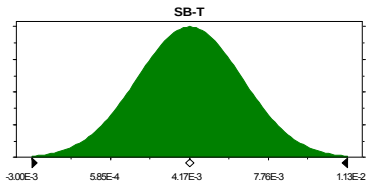


Assumption: SB-T Total Heptachlorobiphenyl

Normal distribution with parameters:

Mean	4.17E-03
Standard Dev.	2.39E-03

Selected range is from -Infinity to +Infinity
Mean value in simulation was 4.19E-3

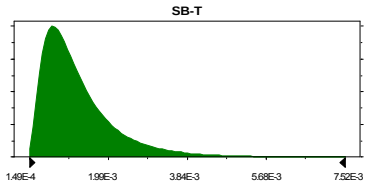


Assumption: SB-T Total Octachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.31E-03
Standard Dev.	9.57E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.32E-3

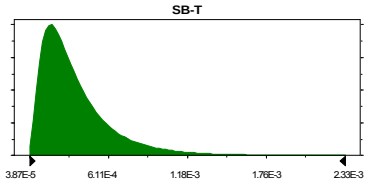


Assumption: SB-T Total Nonachlorobiphenyl

Lognormal distribution with parameters:

Mean	3.79E-04
Standard Dev.	2.92E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.81E-4

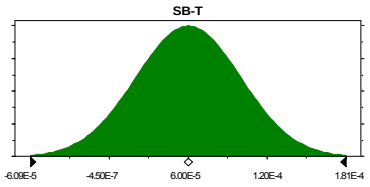


Assumption: SB-T 209-Decachlorobiphenyl

Normal distribution with parameters:

Mean	6.00E-05
Standard Dev.	4.03E-05

Selected range is from -Infinity to +Infinity
Mean value in simulation was 6.01E-5

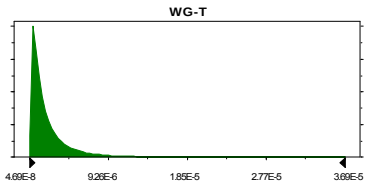


Assumption: WG-T Total Monochlorobiphenyl

Lognormal distribution with parameters:

Mean	2.44E-06
Standard Dev.	3.81E-06

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.41E-6

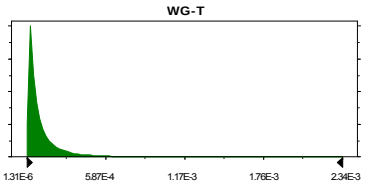


Assumption: WG-T Total Dichlorobiphenyl

Lognormal distribution with parameters:

Mean	1.21E-04
Standard Dev.	2.34E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.18E-4

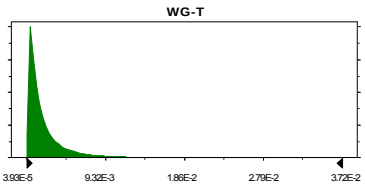


Assumption: WG-T Total Trichlorobiphenyl

Lognormal distribution with parameters:

Mean	2.32E-03
Standard Dev.	3.80E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.35E-3

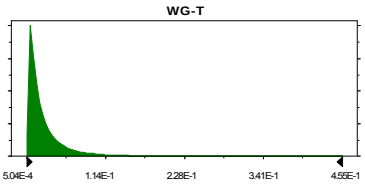


Assumption: WG-T Total Tetrachlorobiphenyl

Lognormal distribution with parameters:

Mean	2.88E-02
Standard Dev.	4.66E-02

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.97E-2

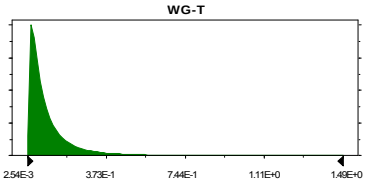


Assumption: WG-T Total Pentachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.08E-01
Standard Dev.	1.56E-01

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.08E-1

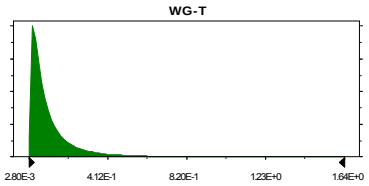


Assumption: WG-T Total Hexachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.19E-01
Standard Dev.	1.72E-01

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.19E-1

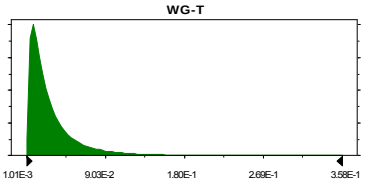


Assumption: WG-T Total Heptachlorobiphenyl

Lognormal distribution with parameters:

Mean	3.07E-02
Standard Dev.	3.89E-02

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.10E-2

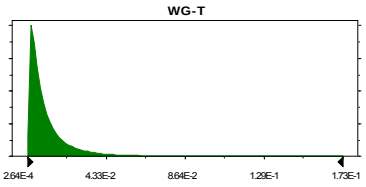


Assumption: WG-T Total Octachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.21E-02
Standard Dev.	1.80E-02

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.25E-2

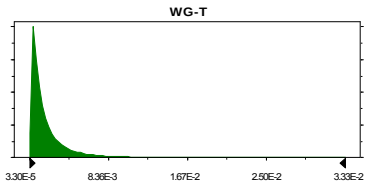


Assumption: WG-T Total Nonachlorobiphenyl

Lognormal distribution with parameters:

Mean	2.04E-03
Standard Dev.	3.40E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 2.05E-3

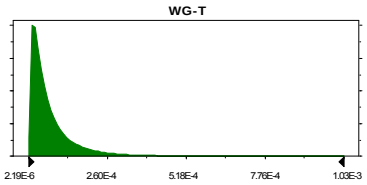


Assumption: WG-T 209-Decachlorobiphenyl

Lognormal distribution with parameters:

Mean	8.05E-05
Standard Dev.	1.10E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 7.97E-5

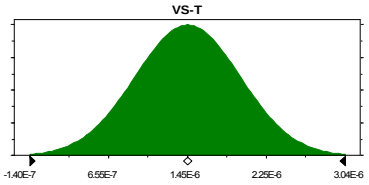


Assumption: VS-T Total Monochlorobiphenyl

Normal distribution with parameters:

Mean	1.45E-06
Standard Dev.	5.30E-07

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.44E-6

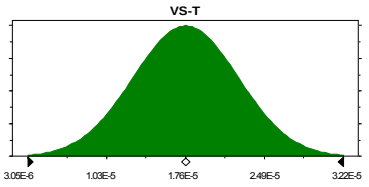


Assumption: VS-T Total Dichlorobiphenyl

Normal distribution with parameters:

Mean	1.76E-05
Standard Dev.	4.85E-06

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.76E-5

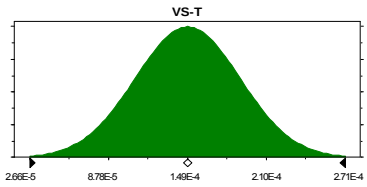


Assumption: VS-T Total Trichlorobiphenyl

Normal distribution with parameters:

Mean	1.49E-04
Standard Dev.	4.08E-05

Selected range is from -Infinity to +Infinity
Mean value in simulation was 1.49E-4

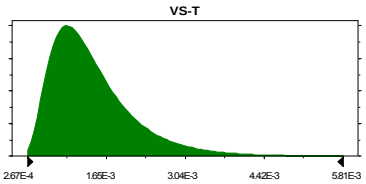


Assumption: VS-T Total Tetrachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.42E-03
Standard Dev.	7.80E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.42E-3

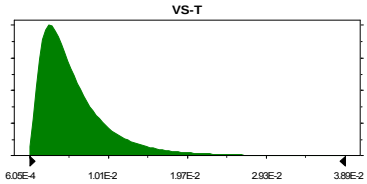


Assumption: VS-T Total Pentachlorobiphenyl

Lognormal distribution with parameters:

Mean	6.17E-03
Standard Dev.	4.85E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 6.15E-3

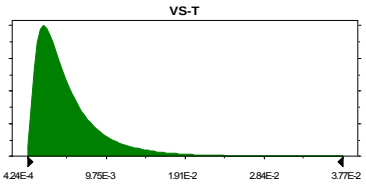


Assumption: VS-T Total Hexachlorobiphenyl

Lognormal distribution with parameters:

Mean	5.29E-03
Standard Dev.	4.58E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 5.36E-3

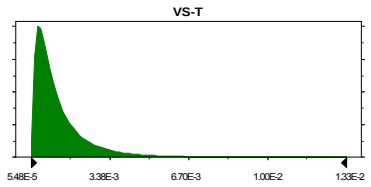


Assumption: VS-T Total Heptachlorobiphenyl

Lognormal distribution with parameters:

Mean	1.30E-03
Standard Dev.	1.49E-03

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 1.28E-3

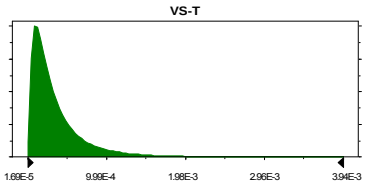


Assumption: VS-T Total Octachlorobiphenyl

Lognormal distribution with parameters:

Mean	3.90E-04
Standard Dev.	4.42E-04

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 3.91E-4

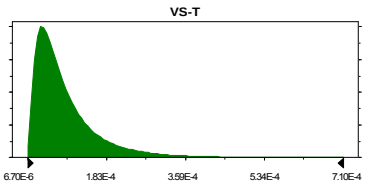


Assumption: VS-T Total Nonachlorobiphenyl

Lognormal distribution with parameters:

Mean	9.33E-05
Standard Dev.	8.50E-05

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 9.23E-5



Assumption: VS-T 209-Decachlorobiphenyl

Lognormal distribution with parameters:

Mean	8.10E-06
Standard Dev.	6.97E-06

Selected range is from 0.00E+0 to +Infinity
Mean value in simulation was 8.10E-6

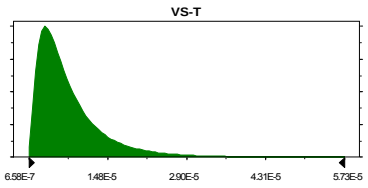


Table F-1A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Monochlorobiphenyl	WG-T	3.57E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000007	1.56E-11
	WG-R	4.57E-07	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.0000009	2.00E-12
	VS-T	1.65E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000003	7.20E-12
	VS-R	1.01E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000002	4.41E-12
	SB-T	2.38E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000004	1.04E-11
	SB-R	9.31E-07	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000002	4.06E-12
Total Dichlorobiphenyls	WG-T	1.74E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.0003	7.60E-10
	WG-R	4.06E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000008	1.77E-11
	VS-T	1.95E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.00004	8.51E-11
	VS-R	1.56E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.00003	6.81E-11
	SB-T	2.96E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.00006	1.29E-10
	SB-R	3.03E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	0.4	0.000006	1.32E-11
Total Trichlorobiphenyls	WG-T	4.16E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.008	9.08E-08
	WG-R	3.00E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.00006	6.55E-10
	VS-T	1.64E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0003	3.58E-09
	VS-R	8.61E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0002	1.88E-09
	SB-T	3.11E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0006	6.79E-09
	SB-R	1.44E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.00003	3.14E-10
Total Tetrachlorobiphenyls	WG-T	4.77E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.09	1.04E-06
	WG-R	3.95E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0007	8.62E-09
	VS-T	1.69E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.003	3.69E-08
	VS-R	4.62E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0009	1.01E-08
	SB-T	4.44E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.008	9.69E-08
	SB-R	2.35E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0004	5.13E-09

Table F-1A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Pentachlorobiphenyls	WG-T	1.63E-01	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.3	3.56E-06
	WG-R	2.71E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.005	5.92E-08
	VS-T	7.95E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.02	1.74E-07
	VS-R	2.27E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.004	4.96E-08
	SB-T	2.00E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.04	4.37E-07
	SB-R	1.10E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.002	2.40E-08
Total Hexachlorobiphenyls	WG-T	1.91E-01	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.4	4.17E-06
	WG-R	2.80E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.005	6.11E-08
	VS-T	6.86E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.01	1.50E-07
	VS-R	3.55E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.007	7.75E-08
	SB-T	2.01E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.04	4.39E-07
	SB-R	3.41E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.006	7.44E-08
Total Heptachlorobiphenyls	WG-T	5.10E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.1	1.11E-06
	WG-R	5.61E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.001	1.22E-08
	VS-T	1.82E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.003	3.97E-08
	VS-R	1.17E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.002	2.55E-08
	SB-T	5.48E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.01	1.20E-07
	SB-R	2.32E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.004	5.06E-08
Total Octachlorobiphenyls	WG-T	2.01E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.04	4.39E-07
	WG-R	2.09E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0004	4.56E-09
	VS-T	5.35E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.001	1.17E-08
	VS-R	3.87E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0007	8.45E-09
	SB-T	2.32E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.004	5.06E-08
	SB-R	8.38E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.002	1.83E-08

Table F-1A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Nonachlorobiphenyls	WG-T	3.18E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.006	6.94E-08
	WG-R	1.06E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0002	2.31E-09
	VS-T	1.22E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0002	2.66E-09
	VS-R	1.39E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0003	3.03E-09
	SB-T	6.50E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.001	1.42E-08
	SB-R	3.27E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0006	7.14E-09
209 - Decachlorobiphenyl	WG-T	1.16E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0002	2.53E-09
	WG-R	1.96E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.00004	4.28E-10
	VS-T	1.06E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.00002	2.31E-10
	VS-R	1.78E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.00003	3.89E-10
	SB-T	8.20E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0002	1.79E-09
	SB-R	5.89E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.0001	1.29E-09
														Total :	**WG-T**	1.E-05
															WG-R	1.E-07
															VS-T	4.E-07
															VS-R	2.E-07
															SB-T	1.E-06
															SB-R	2.E-07
Total Polychlorinated Biphenyls	WG-T	4.56E-01	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.9	9.96E-06
	WG-R	6.86E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.01	1.50E-07
	VS-T	1.91E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.04	4.17E-07
	VS-R	8.02E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.02	1.75E-07
	SB-T	5.22E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.1	1.14E-06

Table F-1A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
	SB-R	8.12E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	2	0.02	1.77E-07

Table F-2A
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
105 - 2,3,3',4,4'-Pentachlorobiphenyl	WG-T	1.56E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.03	2.55E-06
	WG-R	3.11E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0006	5.09E-08
	VS-T	6.18E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.001	1.01E-07
	VS-R	1.87E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0004	3.06E-08
	SB-T	1.54E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.003	2.52E-07
	SB-R	1.30E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0002	2.13E-08
114 - 2,3,4,4',5-Pentachlorobiphenyl	WG-T	1.03E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.002	8.43E-07
	WG-R	1.88E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00004	1.54E-08
	VS-T	3.58E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00007	2.93E-08
	VS-R	1.02E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00002	8.35E-09
	SB-T	1.02E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0002	8.35E-08
	SB-R	7.21E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00001	5.90E-09
118 - 2,3',4,4',5-Pentachlorobiphenyl	WG-T	4.69E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.09	7.68E-06
	WG-R	8.80E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.002	1.44E-07
	VS-T	1.73E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.003	2.83E-07
	VS-R	5.49E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.001	8.99E-08
	SB-T	5.27E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.01	8.63E-07
	SB-R	4.17E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0008	6.83E-08
123 - 2',3,4,4',5-Pentachlorobiphenyl	WG-T	5.46E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.001	8.94E-08
	WG-R	5.84E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00001	9.56E-10
	VS-T	2.49E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00005	4.08E-09
	VS-R	9.04E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00002	1.48E-09
	SB-T	6.06E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0001	9.92E-09
	SB-R	5.26E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00001	8.61E-10

Table F-2A
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
126 - 3,3',4,4',5-Pentachlorobiphenyl	WG-T	1.33E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.00003	2.18E-06
	WG-R	1.61E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.000003	2.64E-07
	VS-T	3.72E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.000007	6.09E-07
	VS-R	3.39E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.000006	5.55E-07
	SB-T	1.26E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.00002	2.06E-06
	SB-R	2.94E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15000	0.000006	4.81E-07
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	WG-T	6.63E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.01	5.43E-06
	WG-R	1.18E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0002	9.66E-08
	VS-T	2.09E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0004	1.71E-07
	VS-R	9.19E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0002	7.52E-08
	SB-T	6.35E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.001	5.20E-07
	SB-R	8.99E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0002	7.36E-08
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	WG-T	1.30E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.002	1.06E-06
	WG-R	2.24E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00004	1.83E-08
	VS-T	4.67E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00009	3.82E-08
	VS-R	2.51E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00005	2.05E-08
	SB-T	1.55E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0003	1.27E-07
	SB-R	2.41E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00005	1.97E-08
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	WG-T	2.47E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.005	4.04E-08
	WG-R	4.40E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.00008	7.20E-10
	VS-T	7.90E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.0001	1.29E-09
	VS-R	4.28E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.00008	7.01E-10
	SB-T	2.60E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.0005	4.26E-09
	SB-R	3.51E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.00007	5.75E-10

Table F-2A
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	WG-T	5.40E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.00001	8.84E-08
	WG-R	2.32E-07	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.0000004	3.80E-09
	VS-T	1.01E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.000002	1.65E-08
	VS-R	5.96E-07	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.000001	9.76E-09
	SB-T	5.64E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.00001	9.23E-08
	SB-R	1.11E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1500	0.000002	1.82E-08
170 - 2,2',3,3',4,4',5-Heptachlorobiphen	WG-T	5.59E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.01	9.15E-07
	WG-R	8.55E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0002	1.40E-08
	VS-T	1.96E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0004	3.21E-08
	VS-R	1.26E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0002	2.06E-08
	SB-T	6.08E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.001	9.96E-08
	SB-R	2.36E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0004	3.86E-08
180 - 2,2',3,4,4',5,5'-Heptachlorobiphen	WG-T	1.81E-02	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.03	2.96E-07
	WG-R	2.06E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.0004	3.37E-09
	VS-T	5.61E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.001	9.19E-09
	VS-R	3.62E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.0007	5.93E-09
	SB-T	1.50E-03	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.003	2.46E-08
	SB-R	7.32E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	1.5	0.001	1.20E-08
189 - 2,3,3',4,4',5,5'-Heptachlorobiphen	WG-T	2.87E-04	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.0005	4.70E-08
	WG-R	5.00E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.000009	8.19E-10
	VS-T	7.92E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00001	1.30E-09
	VS-R	6.45E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00001	1.06E-09
	SB-T	2.48E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00005	4.06E-09
	SB-R	9.66E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	15	0.00002	1.58E-09

Table F-2A
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Reasonable Maximum Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
77 - 3,3',4,4'-Tetrachlorobiphenyl	WG-T	9.73E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.0002	7.97E-08
	WG-R	1.71E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.000003	1.40E-09
	VS-T	8.41E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00002	6.88E-09
	VS-R	8.71E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00002	7.13E-09
	SB-T	1.29E-05	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.00002	1.06E-08
	SB-R	2.25E-06	5.67E-03	0.1	365	6	15	2190	1.59E-02	24	71	25550	2.00E-05	75	0.000004	1.84E-09
														Total : WG-T	0.2	2.E-05
														WG-R	0.003	6.E-07
														VS-T	0.007	1.E-06
														VS-R	0.003	8.E-07
														SB-T	0.02	4.E-06
														SB-R	0.003	7.E-07

Table F-1B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
FI = Fractional Ingestion Factor (unitless)
IR_c = Fish Ingestion Rate in Children (kg/day)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Monochlorobiphenyl	WG-T	2.44E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.000001	1.21E-12
	WG-R	3.71E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.0000002	1.84E-13
	VS-T	1.45E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.0000008	7.20E-13
	VS-R	8.28E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.0000005	4.11E-13
	SB-T	1.94E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.000001	9.63E-13
	SB-R	7.36E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.0000004	3.65E-13
Total Dichlorobiphenyls	WG-T	1.21E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.00007	6.00E-11
	WG-R	3.09E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.000002	1.53E-12
	VS-T	1.76E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.00001	8.73E-12
	VS-R	1.39E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.000008	6.90E-12
	SB-T	2.25E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.00001	1.12E-11
	SB-R	2.50E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	0.4	0.000001	1.24E-12
Total Trichlorobiphenyls	WG-T	2.32E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.001	5.76E-09
	WG-R	2.06E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00001	5.11E-11
	VS-T	1.49E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00008	3.70E-10
	VS-R	7.31E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00004	1.81E-10
	SB-T	2.35E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0001	5.83E-10
	SB-R	9.78E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.000005	2.43E-11
Total Tetrachlorobiphenyls	WG-T	2.88E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.02	7.15E-08
	WG-R	1.93E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0001	4.79E-10
	VS-T	1.42E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0008	3.52E-09
	VS-R	3.90E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0002	9.68E-10
	SB-T	3.29E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.002	8.16E-09
	SB-R	1.12E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00006	2.78E-10

Table F-1B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
FI = Fractional Ingestion Factor (unitless)
IR_c = Fish Ingestion Rate in Children (kg/day)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Pentachlorobiphenyls	WG-T	1.08E-01	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.06	2.68E-07
	WG-R	1.40E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0008	3.47E-09
	VS-T	6.17E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.003	1.53E-08
	VS-R	1.99E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.001	4.94E-09
	SB-T	1.49E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.008	3.70E-08
	SB-R	8.43E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0005	2.09E-09
Total Hexachlorobiphenyls	WG-T	1.19E-01	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.07	2.95E-07
	WG-R	1.70E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0009	4.22E-09
	VS-T	5.29E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.003	1.31E-08
	VS-R	3.03E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.002	7.52E-09
	SB-T	1.54E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.009	3.82E-08
	SB-R	2.43E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.001	6.03E-09
Total Heptachlorobiphenyls	WG-T	3.07E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.02	7.62E-08
	WG-R	4.16E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0002	1.03E-09
	VS-T	1.30E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0007	3.23E-09
	VS-R	9.88E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0006	2.45E-09
	SB-T	4.17E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.002	1.03E-08
	SB-R	1.50E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0008	3.72E-09
Total Octachlorobiphenyls	WG-T	1.21E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.007	3.00E-08
	WG-R	1.57E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00009	3.90E-10
	VS-T	3.90E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0002	9.68E-10
	VS-R	3.43E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0002	8.51E-10
	SB-T	1.31E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0007	3.25E-09
	SB-R	6.23E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0003	1.55E-09

Table F-1B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
FI = Fractional Ingestion Factor (unitless)
IR_c = Fish Ingestion Rate in Children (kg/day)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
Total Nonachlorobiphenyls	WG-T	2.04E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.001	5.06E-09
	WG-R	7.41E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00004	1.84E-10
	VS-T	9.33E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00005	2.32E-10
	VS-R	1.22E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00007	3.03E-10
	SB-T	3.79E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0002	9.40E-10
	SB-R	2.55E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.0001	6.33E-10
209 - Decachlorobiphenyl	WG-T	8.05E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00004	2.00E-10
	WG-R	1.48E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.000008	3.67E-11
	VS-T	8.10E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.000005	2.01E-11
	VS-R	1.41E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.000008	3.50E-11
	SB-T	6.00E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00003	1.49E-10
	SB-R	4.70E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.00003	1.17E-10
													Total :	**WG-T**	0.2	8.E-07
														WG-R	0.002	1.E-08
														VS-T	0.008	4.E-08
														VS-R	0.004	2.E-08
														SB-T	0.02	1.E-07
														SB-R	0.003	1.E-08
Total Polychlorinated Biphenyls	WG-T	3.03E-01	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.2	7.52E-07
	WG-R	3.99E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.002	9.90E-09
	VS-T	1.48E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.008	3.67E-08
	VS-R	6.96E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.004	1.73E-08
	SB-T	3.98E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.02	9.88E-08

Table F-1B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
FI = Fractional Ingestion Factor (unitless)
IR_c = Fish Ingestion Rate in Children (kg/day)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
	SB-R	5.83E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	2	0.003	1.45E-08

Table F-2B
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Where CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
105 - 2,3,3',4,4'-Pentachlorobiphenyl	WG-T	1.04E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.006	1.94E-07
	WG-R	1.64E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00009	3.05E-09
	VS-T	4.64E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0003	8.64E-09
	VS-R	1.65E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00009	3.07E-09
	SB-T	1.21E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0007	2.25E-08
	SB-R	1.02E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00006	1.90E-09
114 - 2,3,4,4',5-Pentachlorobiphenyl	WG-T	6.73E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.0004	6.26E-08
	WG-R	9.98E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000006	9.29E-10
	VS-T	2.64E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00001	2.46E-09
	VS-R	9.03E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000005	8.40E-10
	SB-T	7.55E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00004	7.03E-09
	SB-R	5.64E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000003	5.25E-10
118 - 2,3',4,4',5-Pentachlorobiphenyl	WG-T	3.03E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.02	5.64E-07
	WG-R	4.79E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0003	8.91E-09
	VS-T	1.28E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0007	2.38E-08
	VS-R	4.72E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0003	8.78E-09
	SB-T	3.95E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.002	7.35E-08
	SB-R	3.17E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0002	5.90E-09
123 - 2',3,4,4',5-Pentachlorobiphenyl	WG-T	3.35E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0002	6.23E-09
	WG-R	4.75E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000003	8.84E-11
	VS-T	1.79E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00001	3.33E-10
	VS-R	7.99E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000004	1.49E-10
	SB-T	4.60E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00003	8.56E-10
	SB-R	2.97E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000002	5.53E-11

Table F-2B
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Where CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
126 - 3,3',4,4',5-Pentachlorobiphenyl	WG-T	1.14E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.000006	2.12E-07
	WG-R	9.91E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.0000006	1.84E-08
	VS-T	2.77E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.000002	5.16E-08
	VS-R	3.01E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.000002	5.60E-08
	SB-T	7.33E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.000004	1.36E-07
	SB-R	2.23E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15000	0.000001	4.15E-08
156 - 2,3,3',4,4',5-Hexachlorobiphenyl	WG-T	4.46E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.002	4.15E-07
	WG-R	6.41E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00004	5.96E-09
	VS-T	1.51E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00008	1.41E-08
	VS-R	8.07E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00005	7.51E-09
	SB-T	4.72E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.0003	4.39E-08
	SB-R	6.35E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00004	5.91E-09
157 - 2,3,3',4,4',5'-Hexachlorobiphenyl	WG-T	8.79E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.0005	8.18E-08
	WG-R	1.69E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000009	1.57E-09
	VS-T	3.49E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00002	3.25E-09
	VS-R	2.20E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00001	2.05E-09
	SB-T	1.18E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00007	1.10E-08
	SB-R	1.76E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00001	1.64E-09
167 - 2,3',4,4',5,5'-Hexachlorobiphenyl	WG-T	1.60E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0009	2.98E-09
	WG-R	2.57E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.00001	4.78E-11
	VS-T	6.00E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.00003	1.12E-10
	VS-R	3.64E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.00002	6.77E-11
	SB-T	1.96E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0001	3.65E-10
	SB-R	2.56E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.00001	4.76E-11

Table F-2B
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Where CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
169 - 3,3',4,4',5,5'-Hexachlorobiphenyl	WG-T	6.43E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.000004	1.20E-08
	WG-R	1.75E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.0000001	3.26E-10
	VS-T	6.96E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.0000004	1.30E-09
	VS-R	5.69E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.0000003	1.06E-09
	SB-T	3.18E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.000002	5.92E-09
	SB-R	9.48E-07	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1500	0.0000005	1.76E-09
170 - 2,2',3,3',4,4',5-Heptachlorobiphen	WG-T	3.41E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.002	6.35E-08
	WG-R	6.45E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00004	1.20E-09
	VS-T	1.37E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00008	2.55E-09
	VS-R	1.02E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00006	1.90E-09
	SB-T	4.77E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.0003	8.88E-09
	SB-R	1.49E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00008	2.77E-09
180 - 2,2',3,4,4',5,5'-Heptachlorobiphen	WG-T	1.10E-02	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.006	2.05E-08
	WG-R	1.53E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.00009	2.85E-10
	VS-T	3.82E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0002	7.11E-10
	VS-R	2.94E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0002	5.47E-10
	SB-T	1.16E-03	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0006	2.16E-09
	SB-R	4.42E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	1.5	0.0002	8.23E-10
189 - 2,3,3',4,4',5,5'-Heptachlorobiphen	WG-T	1.74E-04	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00	3.24E-09
	WG-R	3.51E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000002	6.53E-11
	VS-T	6.09E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000003	1.13E-10
	VS-R	5.66E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000003	1.05E-10
	SB-T	1.92E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.00001	3.57E-10
	SB-R	6.36E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	15	0.000004	1.18E-10

Table F-2B
Deterministic Risk Evaluation for Dioxin-like PCBs
Consumption of Fish Caught at Reference and Target Reefs
Average Exposure Scenario

Equation 1: $HI = ((CF*IR_c*FI*EF*ED_c)/(BW_c*AT_{nc}))*(1/R_fD)$

Equation 2: $CR = ((CF*EF*FI*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where: HI = Hazard Index (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
FI = Fractional Ingestion Factor (unitless)
EF = Exposure Frequency (days/year)
ED_c = Exposure Duration for Children (years)
BW_c = Body Weight of Child (kg)
AT_{nc} = Averaging Time for Non-Carcinogens ((365 days/year)*ED_c)
R_fD = Reference Dose (mg/kg/day)

Where CR = Cancer Risk (unitless)
IR_a = Fish Ingestion Rate in Adults (kg/day)
ED_a = Exposure Duration for Adults (years)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	AT_{nc}	IR_a	ED_a	BW_a	AT_c	RfD	SF	Hazard Index	Cancer Risk
77 - 3,3',4,4'-Tetrachlorobiphenyl	WG-T	6.02E-05	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.00003	5.60E-09
	WG-R	1.11E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.0000006	1.03E-10
	VS-T	6.73E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000004	6.26E-10
	VS-R	6.81E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000004	6.34E-10
	SB-T	9.36E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.000005	8.71E-10
	SB-R	1.18E-06	1.67E-03	0.1	365	6	15	2190	4.70E-03	3	71	25550	2.00E-05	75	0.0000007	1.10E-10
														Total :	**WG-T**	0.04	2.E-06
															WG-R	0.0006	4.E-08
															VS-T	0.001	1.E-07
															VS-R	0.0007	8.E-08
															SB-T	0.004	3.E-07
															SB-R	0.0006	6.E-08

Table F-3A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Reasonable Maximum Exposure Scenario

Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:
CR = Cancer Risk (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
IR_a = Fish Ingestion Rate in Adults (kg/day)
FI = Fractional Ingestion Factor (unitless)
ED_c = Exposure Duration for Children (years)
ED_a = Exposure Duration for Adults (years)
EF = Exposure Frequency (days/year)
BW_c = Body Weight of Child (kg)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Monochlorobiphenyl	WG-T	3.57E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.56E-10
	WG-R	4.57E-07	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.00E-11
	VS-T	1.65E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.20E-11
	VS-R	1.01E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	4.41E-11
	SB-T	2.38E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.04E-10
	SB-R	9.31E-07	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	4.06E-11
Total Dichlorobiphenyls	WG-T	1.74E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.60E-09
	WG-R	4.06E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.77E-10
	VS-T	1.95E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.51E-10
	VS-R	1.56E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	6.81E-10
	SB-T	2.96E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.29E-09
	SB-R	3.03E-06	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.32E-10
Total Trichlorobiphenyls	WG-T	4.16E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.82E-07
	WG-R	3.00E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.31E-09
	VS-T	1.64E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.16E-09
	VS-R	8.61E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.76E-09
	SB-T	3.11E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.36E-08
	SB-R	1.44E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	6.29E-10
Total Tetrachlorobiphenyls	WG-T	4.77E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.08E-06
	WG-R	3.95E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.72E-08
	VS-T	1.69E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.38E-08
	VS-R	4.62E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.02E-08
	SB-T	4.44E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.94E-07
	SB-R	2.35E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.03E-08

Table F-3A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Reasonable Maximum Exposure Scenario

Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:
CR = Cancer Risk (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
IR_a = Fish Ingestion Rate in Adults (kg/day)
FI = Fractional Ingestion Factor (unitless)
ED_c = Exposure Duration for Children (years)
ED_a = Exposure Duration for Adults (years)
EF = Exposure Frequency (days/year)
BW_c = Body Weight of Child (kg)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Pentachlorobiphenyls	WG-T	1.63E-01	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.12E-06
	WG-R	2.71E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.18E-07
	VS-T	7.95E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.47E-07
	VS-R	2.27E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	9.91E-08
	SB-T	2.00E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.73E-07
	SB-R	1.10E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	4.80E-08
Total Hexachlorobiphenyls	WG-T	1.91E-01	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.34E-06
	WG-R	2.80E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.22E-07
	VS-T	6.86E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.00E-07
	VS-R	3.55E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.55E-07
	SB-T	2.01E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.78E-07
	SB-R	3.41E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.49E-07
Total Heptachlorobiphenyls	WG-T	5.10E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.23E-06
	WG-R	5.61E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.45E-08
	VS-T	1.82E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.95E-08
	VS-R	1.17E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	5.11E-08
	SB-T	5.48E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.39E-07
	SB-R	2.32E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.01E-07
Total Octachlorobiphenyls	WG-T	2.01E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.78E-07
	WG-R	2.09E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	9.13E-09
	VS-T	5.35E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.34E-08
	VS-R	3.87E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.69E-08
	SB-T	2.32E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.01E-07
	SB-R	8.38E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.66E-08

Table F-3A
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Reasonable Maximum Exposure Scenario

Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:

CR = Cancer Risk (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
IR_a = Fish Ingestion Rate in Adults (kg/day)
FI = Fractional Ingestion Factor (unitless)
ED_c = Exposure Duration for Children (years)
ED_a = Exposure Duration for Adults (years)
EF = Exposure Frequency (days/year)
BW_c = Body Weight of Child (kg)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Nonachlorobiphenyls	WG-T	3.18E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.39E-07
	WG-R	1.06E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	4.63E-09
	VS-T	1.22E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	5.33E-09
	VS-R	1.39E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	6.07E-09
	SB-T	6.50E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.84E-08
	SB-R	3.27E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.43E-08
209 - Decachlorobiphenyl	WG-T	1.16E-04	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	5.06E-09
	WG-R	1.96E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.56E-10
	VS-T	1.06E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	4.63E-10
	VS-R	1.78E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	7.77E-10
	SB-T	8.20E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.58E-09
	SB-R	5.89E-05	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.57E-09
											Total:	**WG-T**	2.E-05
												WG-R	3.E-07
												VS-T	8.E-07
												VS-R	4.E-07
												SB-T	2.E-06
												SB-R	4.E-07
Total Polychlorinated Biphenyls	WG-T	4.56E-01	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	1.99E-05
	WG-R	6.86E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.00E-07
	VS-T	1.91E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	8.34E-07
	VS-R	8.02E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.50E-07
	SB-T	5.22E-02	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	2.28E-06
	SB-R	8.12E-03	5.67E-03	0.1	365	6	15	1.59E-02	24	71	25550	4	3.55E-07

Table F-3B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Average Exposure Scenario

Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:
CR = Cancer Risk (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
IR_a = Fish Ingestion Rate in Adults (kg/day)
FI = Fractional Ingestion Factor (unitless)
ED_c = Exposure Duration for Children (years)
ED_a = Exposure Duration for Adults (years)
EF = Exposure Frequency (days/year)
BW_c = Body Weight of Child (kg)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Monochlorobiphenyl	WG-T	2.44E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.21E-11
	WG-R	3.71E-07	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.84E-12
	VS-T	1.45E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.20E-12
	VS-R	8.28E-07	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.11E-12
	SB-T	1.94E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	9.63E-12
	SB-R	7.36E-07	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.65E-12
Total Dichlorobiphenyls	WG-T	1.21E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.00E-10
	WG-R	3.09E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.53E-11
	VS-T	1.76E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	8.73E-11
	VS-R	1.39E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.90E-11
	SB-T	2.25E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.12E-10
	SB-R	2.50E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.24E-11
Total Trichlorobiphenyls	WG-T	2.32E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.15E-08
	WG-R	2.06E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.02E-10
	VS-T	1.49E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.39E-10
	VS-R	7.31E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.63E-10
	SB-T	2.35E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.17E-09
	SB-R	9.78E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.85E-11
Total Tetrachlorobiphenyls	WG-T	2.88E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.43E-07
	WG-R	1.93E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	9.58E-10
	VS-T	1.42E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.05E-09
	VS-R	3.90E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.94E-09
	SB-T	3.29E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.63E-08
	SB-R	1.12E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	5.56E-10

Table F-3B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Average Exposure Scenario

Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:
CR = Cancer Risk (unitless)
CF = Concentration of Chemical in Fish (mg/kg)
IR_c = Fish Ingestion Rate in Children (kg/day)
IR_a = Fish Ingestion Rate in Adults (kg/day)
FI = Fractional Ingestion Factor (unitless)
ED_c = Exposure Duration for Children (years)
ED_a = Exposure Duration for Adults (years)
EF = Exposure Frequency (days/year)
BW_c = Body Weight of Child (kg)
BW_a = Body Weight of Adults (kg)
AT_c = Averaging Time for Carcinogens (25,550 days)
SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Pentachlorobiphenyls	WG-T	1.08E-01	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	5.36E-07
	WG-R	1.40E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.95E-09
	VS-T	6.17E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.06E-08
	VS-R	1.99E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	9.88E-09
	SB-T	1.49E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.39E-08
	SB-R	8.43E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.18E-09
Total Hexachlorobiphenyls	WG-T	1.19E-01	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	5.91E-07
	WG-R	1.70E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	8.44E-09
	VS-T	5.29E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.63E-08
	VS-R	3.03E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.50E-08
	SB-T	1.54E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.64E-08
	SB-R	2.43E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.21E-08
Total Heptachlorobiphenyls	WG-T	3.07E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.52E-07
	WG-R	4.16E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.06E-09
	VS-T	1.30E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.45E-09
	VS-R	9.88E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.90E-09
	SB-T	4.17E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.07E-08
	SB-R	1.50E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.44E-09
Total Octachlorobiphenyls	WG-T	1.21E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.00E-08
	WG-R	1.57E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.79E-10
	VS-T	3.90E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.94E-09
	VS-R	3.43E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.70E-09
	SB-T	1.31E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.50E-09
	SB-R	6.23E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.09E-09

Table F-3B
Deterministic Risk Evaluation for Total PCBs
Consumption of Fish Caught at Reference and Target Reefs
Combined Carcinogenic Risk and Non-Carcinogenic Hazard
Average Exposure Scenario

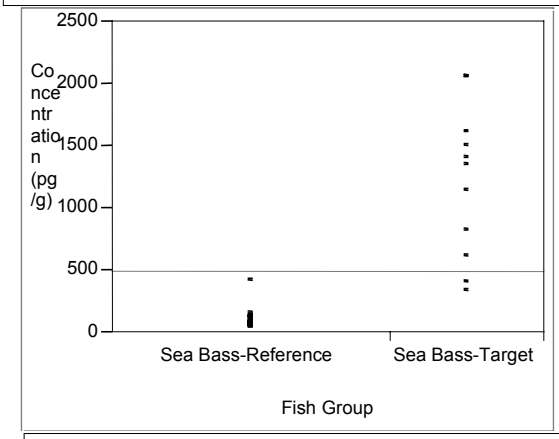
Equation 1: $CR = ((CF*FI*EF*(((IR_c*ED_c)/BW_c)+((IR_a*ED_a)/BW_a)))/AT_c)*SF$

Where:
- CR = Cancer Risk (unitless)
- CF = Concentration of Chemical in Fish (mg/kg)
- IR_c = Fish Ingestion Rate in Children (kg/day)
- IR_a = Fish Ingestion Rate in Adults (kg/day)
- FI = Fractional Ingestion Factor (unitless)
- ED_c = Exposure Duration for Children (years)
- ED_a = Exposure Duration for Adults (years)
- EF = Exposure Frequency (days/year)
- BW_c = Body Weight of Child (kg)
- BW_a = Body Weight of Adults (kg)
- AT_c = Averaging Time for Carcinogens (25,550 days)
- SF = Cancer Slope Factor $(mg/kg/day)^{-1}$

Parameter	Target Group	CF (mg/kg)	IR_c	FI	EF	ED_c	BW_c	IR_a	ED_a	BW_a	AT_c	SF	Cancer Risk
Total Nonachlorobiphenyls	WG-T	2.04E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.01E-08
	WG-R	7.41E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.68E-10
	VS-T	9.33E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.63E-10
	VS-R	1.22E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	6.05E-10
	SB-T	3.79E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.88E-09
	SB-R	2.55E-04	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.27E-09
209 - Decachlorobiphenyl	WG-T	8.05E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.00E-10
	WG-R	1.48E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.34E-11
	VS-T	8.10E-06	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	4.02E-11
	VS-R	1.41E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.00E-11
	SB-T	6.00E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.98E-10
	SB-R	4.70E-05	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.33E-10
											Total:	**WG-T**	2.E-06
												WG-R	2.E-08
												VS-T	7.E-08
												VS-R	3.E-08
												SB-T	2.E-07
												SB-R	3.E-08
Total Polychlorinated Biphenyls	WG-T	3.03E-01	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.50E-06
	WG-R	3.99E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.98E-08
	VS-T	1.48E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	7.34E-08
	VS-R	6.96E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	3.45E-08
	SB-T	3.98E-02	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	1.98E-07
	SB-R	5.83E-03	1.67E-03	0.1	365	6	15	4.70E-03	3	71	25550	4	2.89E-08

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

105-2,3,3',4,4'-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	212	10.6000	-4.439
Sea Bass-Target	11	284	25.8182	4.439

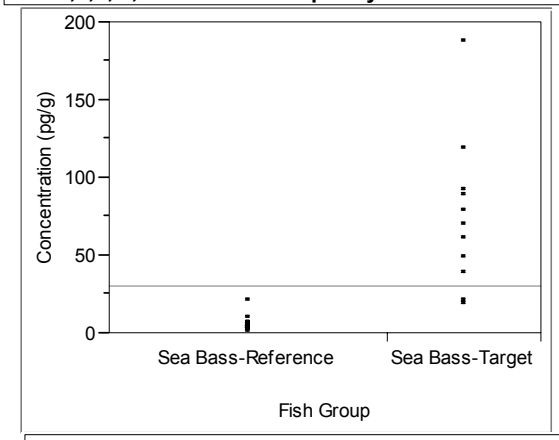
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
284	4.43871	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.8858	1	<.0001

114-2,3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	212	10.6000	-4.438
Sea Bass-Target	11	284	25.8182	4.438

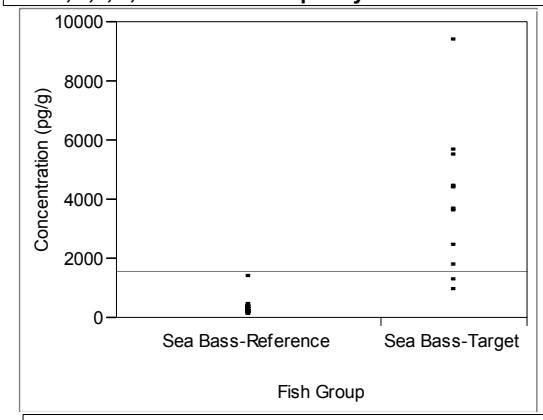
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
284	4.43826	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.8818	1	<.0001

118-2,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	212	10.6000	-4.438
Sea Bass-Target	11	284	25.8182	4.438

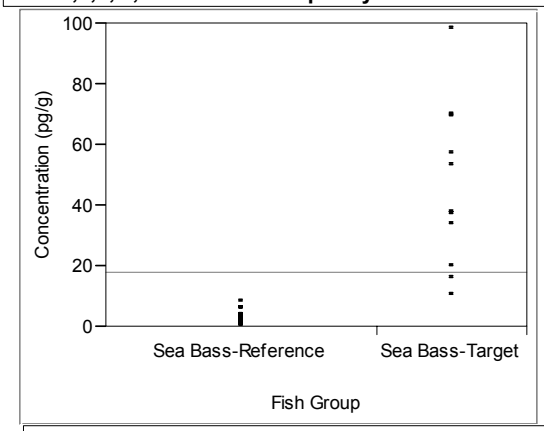
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
284	4.43826	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.8818	1	<.0001

123-2',3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	210	10.5000	-4.521
Sea Bass-Target	11	286	26.0000	4.521

2-Sample Test, Normal Approximation

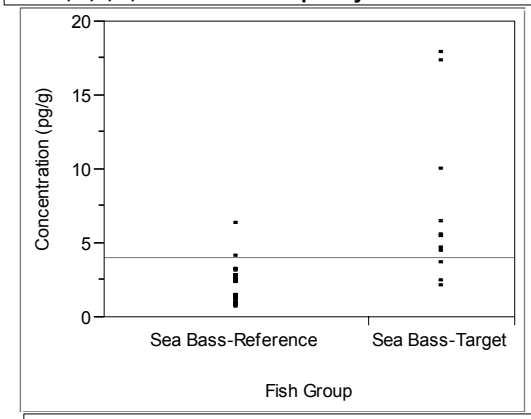
S	Z	Prob>|Z|
286	4.52083	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.6250	1	<.0001

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

126-3,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	234	11.7000	-3.530
Sea Bass-Target	11	262	23.8182	3.530

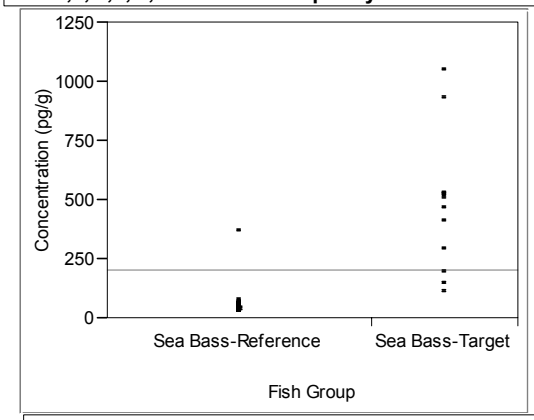
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
262	3.52997	0.0004

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
12.6068	1	0.0004

156-2,3,3',4,4',5-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

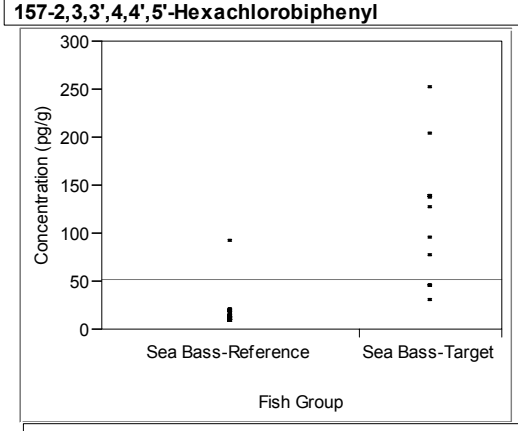
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
282	4.35569	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1523	1	<.0001

157-2,3,3',4,4',5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

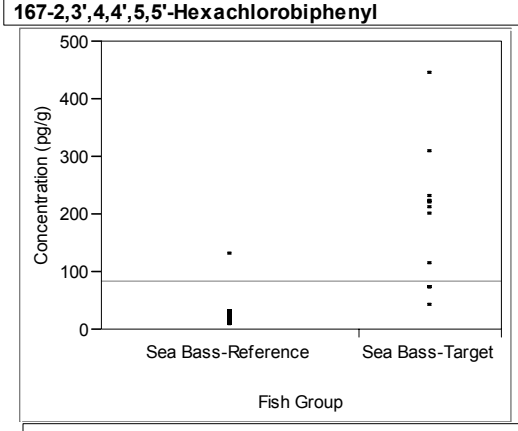
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
282	4.35569	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1523	1	<.0001

167-2,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

2-Sample Test, Normal Approximation

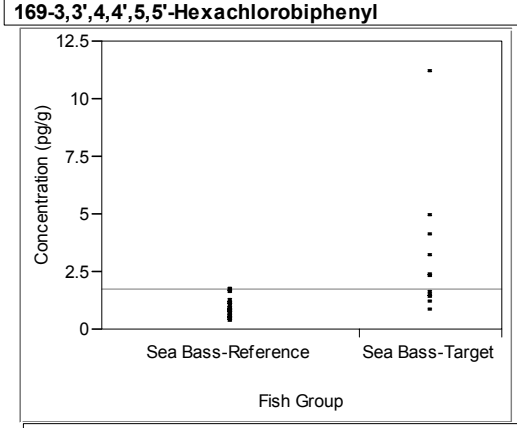
S	Z	Prob>|Z|
282	4.35569	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1523	1	<.0001

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

169-3,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	233	11.6500	-3.571
Sea Bass-Target	11	263	23.9091	3.571

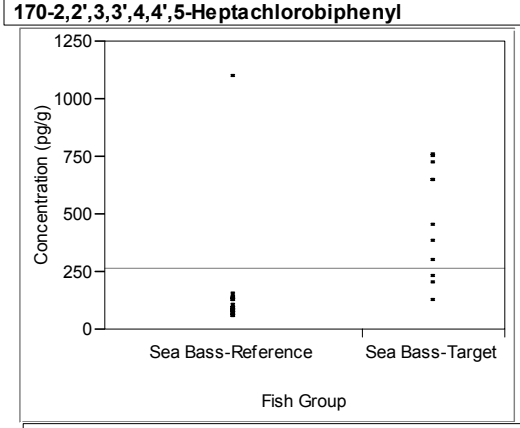
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
263	3.57125	0.0004

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
12.9017	1	0.0003

170-2,2',3,3',4,4',5-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	227	11.3500	-3.819
Sea Bass-Target	11	269	24.4545	3.819

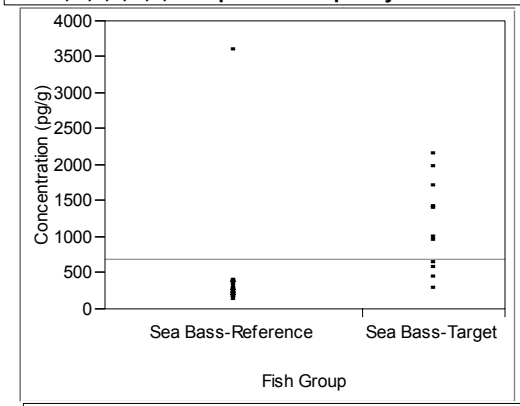
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
269	3.81935	0.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
14.7456	1	0.0001

180-2,2',3,4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	227	11.3500	-3.819
Sea Bass-Target	11	269	24.4545	3.819

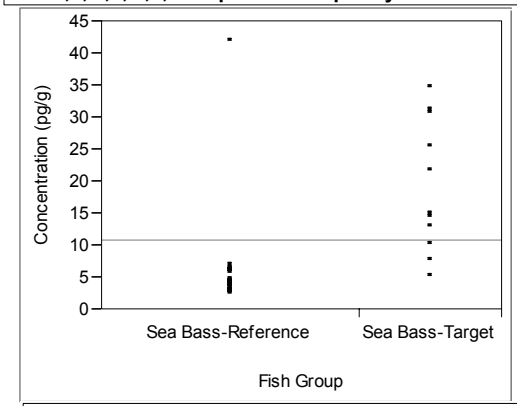
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
269	3.81897	0.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
14.7426	1	0.0001

189-2,3,3',4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	226	11.3000	-3.860
Sea Bass-Target	11	270	24.5455	3.860

2-Sample Test, Normal Approximation

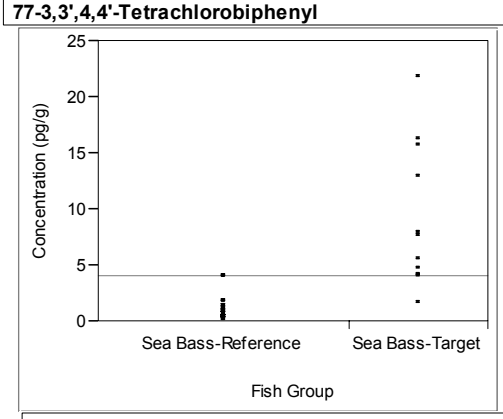
S	Z	Prob>|Z|
270	3.86025	0.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
15.0614	1	0.0001

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

77-3,3',4,4'-Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

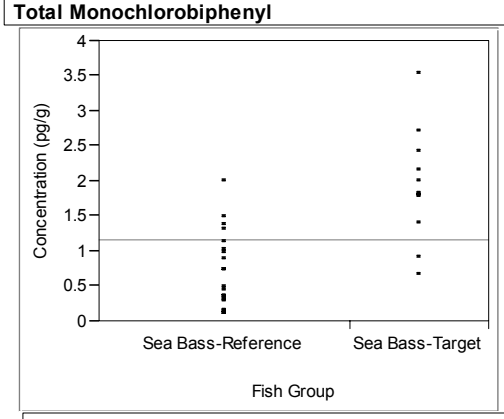
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
282	4.35613	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1561	1	<.0001

Total Monochlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	233	11.6500	-3.571
Sea Bass-Target	11	263	23.9091	3.571

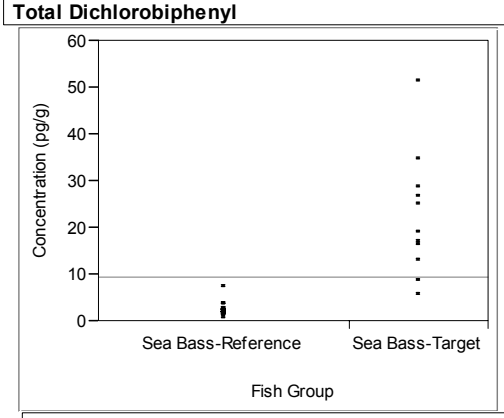
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
263	3.57125	0.0004

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
12.9017	1	0.0003

Total Dichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	211	10.5500	-4.480
Sea Bass-Target	11	285	25.9091	4.480

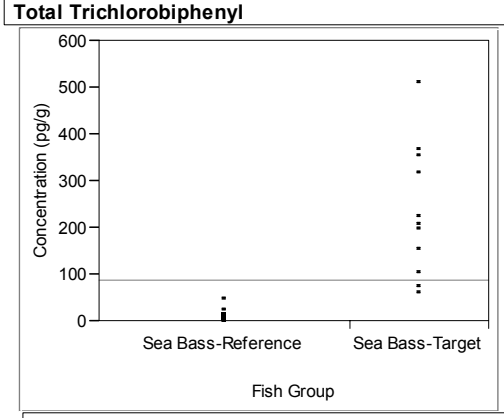
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
285	4.48045	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.2599	1	<.0001

Total Trichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	210	10.5000	-4.521
Sea Bass-Target	11	286	26.0000	4.521

2-Sample Test, Normal Approximation

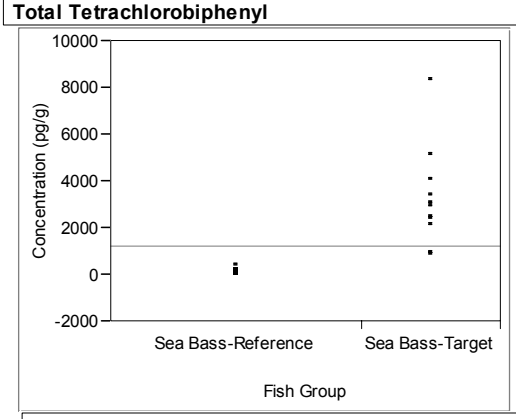
S	Z	Prob>|Z|
286	4.52083	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.6250	1	<.0001

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

Total Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	210	10.5000	-4.521
Sea Bass-Target	11	286	26.0000	4.521

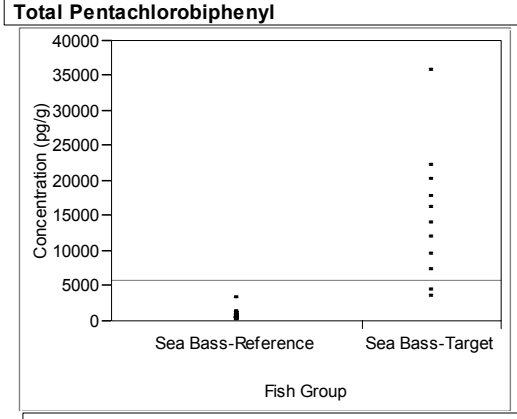
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
286	4.52083	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.6250	1	<.0001

Total Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	210	10.5000	-4.521
Sea Bass-Target	11	286	26.0000	4.521

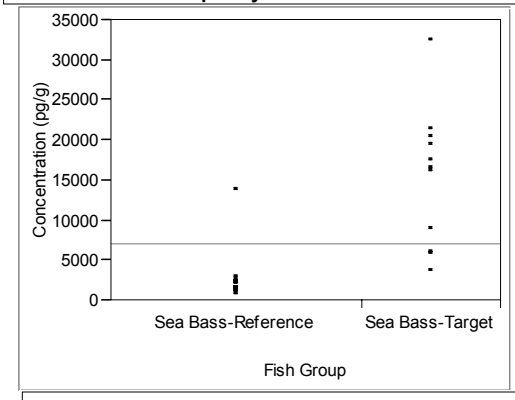
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
286	4.52083	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.6250	1	<.0001

Total Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

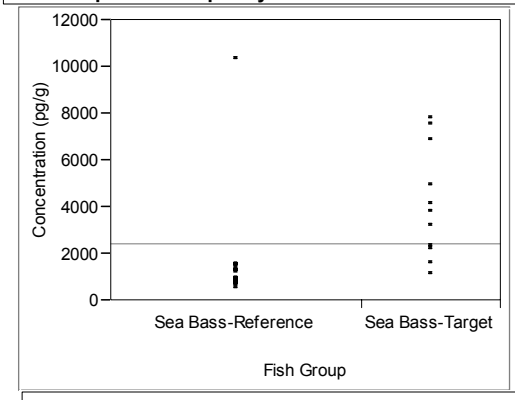
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
282	4.35569	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1523	1	<.0001

Total Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	228	11.4000	-3.778
Sea Bass-Target	11	268	24.3636	3.778

2-Sample Test, Normal Approximation

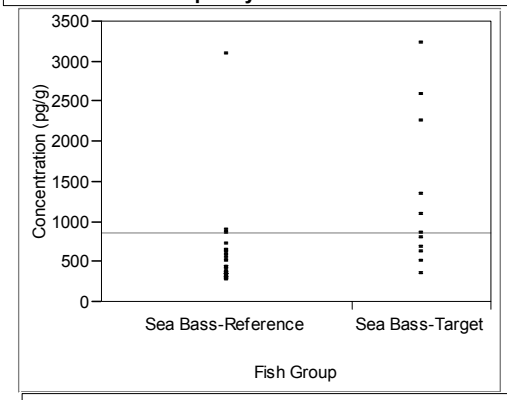
S	Z	Prob>|Z|
268	3.77768	0.0002

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
14.4273	1	0.0001

Results of Wilcoxon Rank Tests
Sea Bass
Navy REEFEX Program

Total Octachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	253	12.6500	-2.746
Sea Bass-Target	11	243	22.0909	2.746

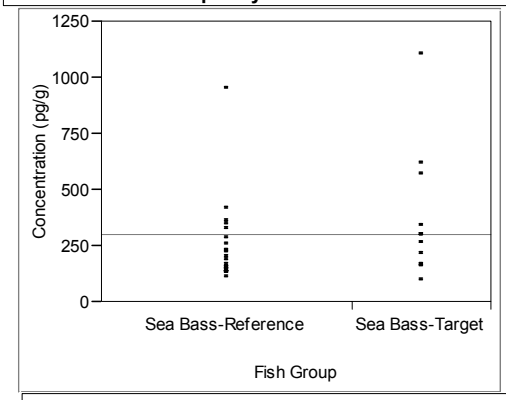
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
243	2.74553	0.0060

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
7.6517	1	0.0057

Total Nonachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	285	14.2500	-1.424
Sea Bass-Target	11	211	19.1818	1.424

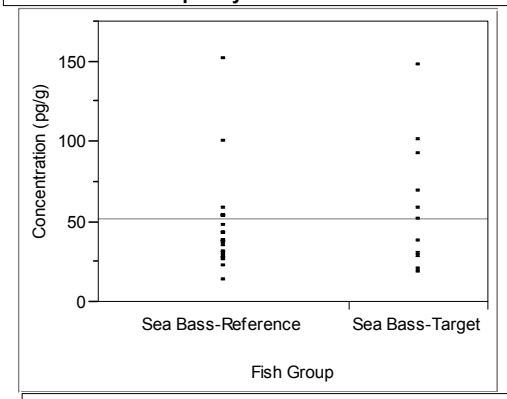
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
211	1.42437	0.1543

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
2.0881	1	0.1485

209-Decachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	303	15.1500	-0.681
Sea Bass-Target	11	193	17.5455	0.681

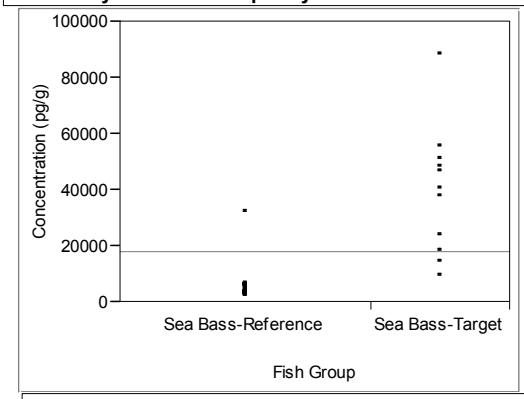
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
193	0.68143	0.4956

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.4929	1	0.4826

Total Polychlorinated Biphenyls



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Sea Bass-Reference	20	214	10.7000	-4.356
Sea Bass-Target	11	282	25.6364	4.356

2-Sample Test, Normal Approximation

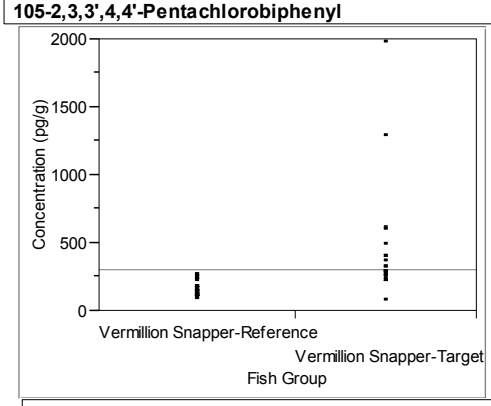
S	Z	Prob>|Z|
282	4.35613	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
19.1561	1	<.0001

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

105-2,3,3',4,4'-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	289	13.1364	-4.622
Vermillion Snapper-Target	20	614	30.7000	4.622

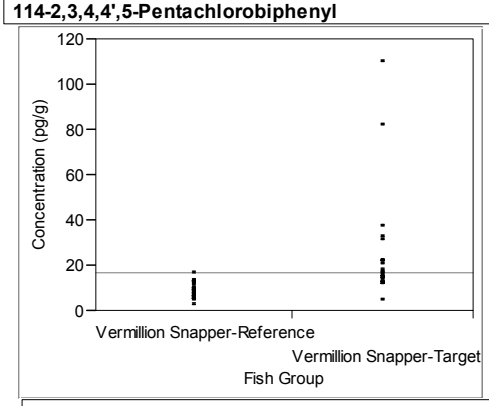
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
614	4.62188	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
21.4784	1	<.0001

114-2,3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	294	13.3636	-4.496
Vermillion Snapper-Target	20	609	30.4500	4.496

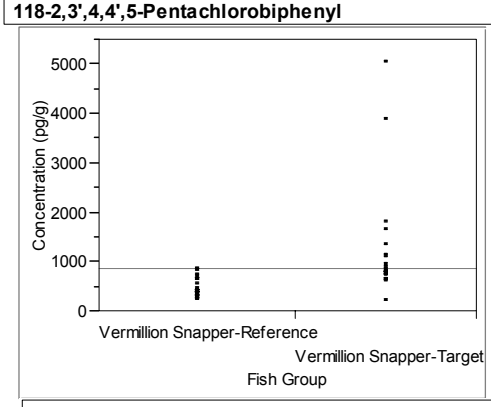
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
609	4.49595	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.3269	1	<.0001

118-2,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	307	13.9545	-4.168
Vermillion Snapper-Target	20	596	29.8000	4.168

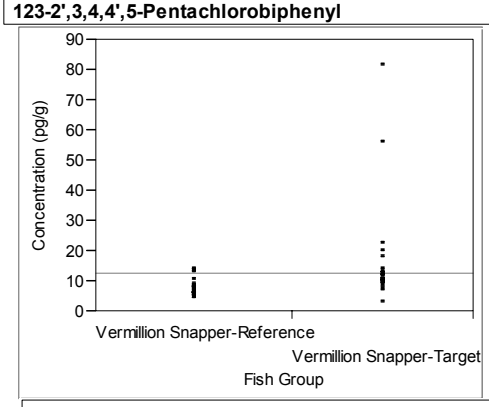
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
596	4.16800	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
17.4774	1	<.0001

123-2',3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	329	14.9545	-3.614
Vermillion Snapper-Target	20	574	28.7000	3.614

2-Sample Test, Normal Approximation

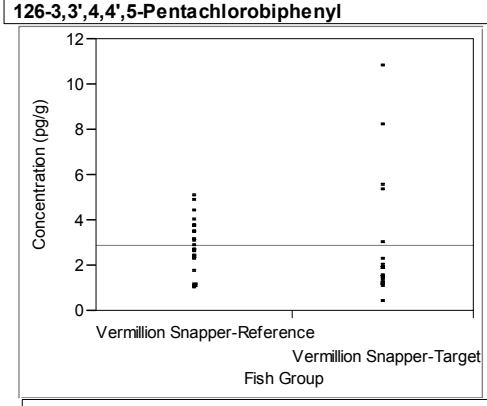
S	Z	Prob>|Z|
574	3.61424	0.0003

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
13.1539	1	0.0003

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

126-3,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	561	25.5000	2.204
Vermillion Snapper-Target	20	342	17.1000	-2.204

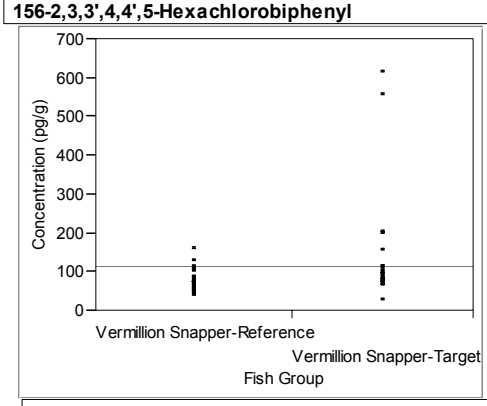
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
342	-2.20372	0.0275

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
4.9120	1	0.0267

156-2,3,3',4,4',5-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	382.5	17.3864	-2.267
Vermillion Snapper-Target	20	520.5	26.0250	2.267

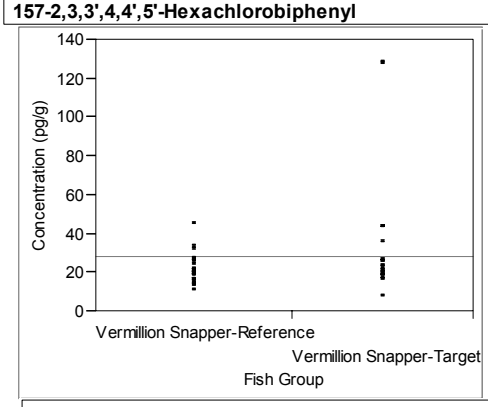
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
520.5	2.26696	0.0234

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
5.1963	1	0.0226

157-2,3,3',4,4',5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	411.5	18.7045	-1.536
Vermillion Snapper-Target	20	491.5	24.5750	1.536

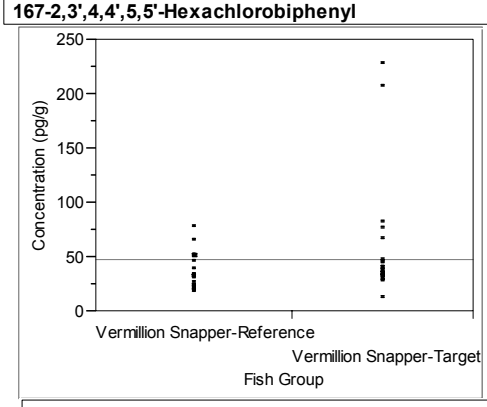
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
491.5	1.53637	0.1244

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
2.3993	1	0.1214

167-2,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	397	18.0455	-1.902
Vermillion Snapper-Target	20	506	25.3000	1.902

2-Sample Test, Normal Approximation

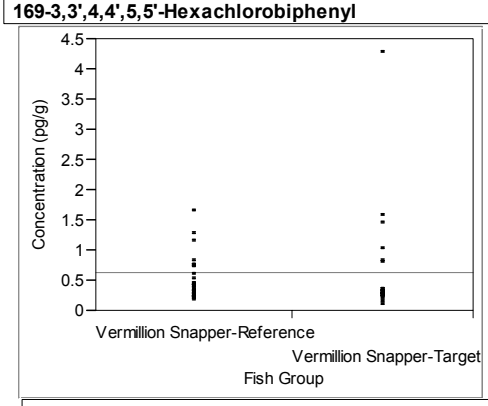
S	Z	Prob>|Z|
506	1.90157	0.0572

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
3.6640	1	0.0556

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

169-3,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	504.5	22.9318	0.781
Vermillion Snapper-Target	20	398.5	19.9250	-0.781

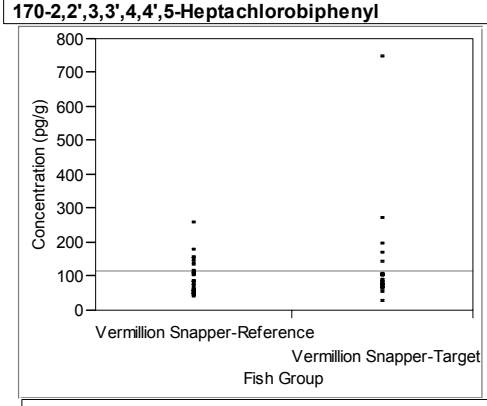
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
398.5	-0.78078	0.4349

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.6294	1	0.4276

170-2,2',3,3',4,4',5-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	451	20.5000	-0.541
Vermillion Snapper-Target	20	452	22.6000	0.541

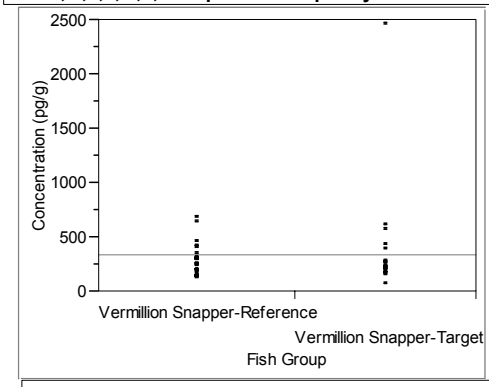
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
452	0.54148	0.5882

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.3070	1	0.5795

180-2,2',3,4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	474.5	21.5682	0.025
Vermillion Snapper-Target	20	428.5	21.4250	-0.025

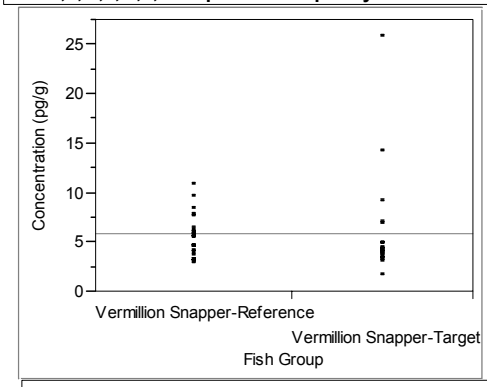
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
428.5	-0.02519	0.9799

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.0014	1	0.9699

189-2,3,3',4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	514	23.3636	1.020
Vermillion Snapper-Target	20	389	19.4500	-1.020

2-Sample Test, Normal Approximation

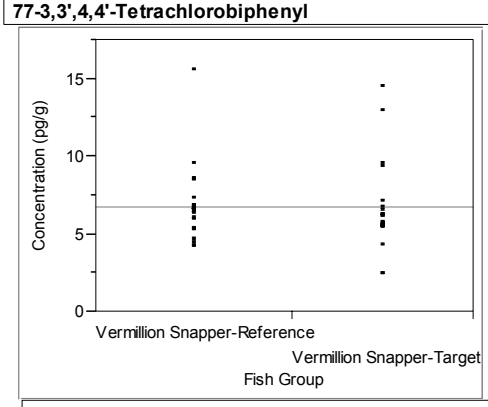
S	Z	Prob>|Z|
389	-1.02005	0.3077

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
1.0663	1	0.3018

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

77-3,3',4,4'-Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	500	22.7273	0.667
Vermillion Snapper-Target	20	403	20.1500	-0.667

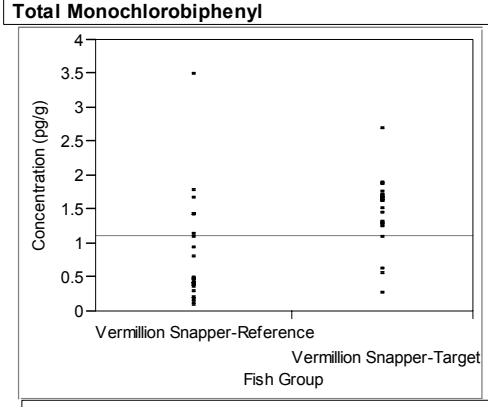
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
403	-0.66744	0.5045

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.4624	1	0.4965

Total Monochlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	341.5	15.5227	-3.299
Vermillion Snapper-Target	20	561.5	28.0750	3.299

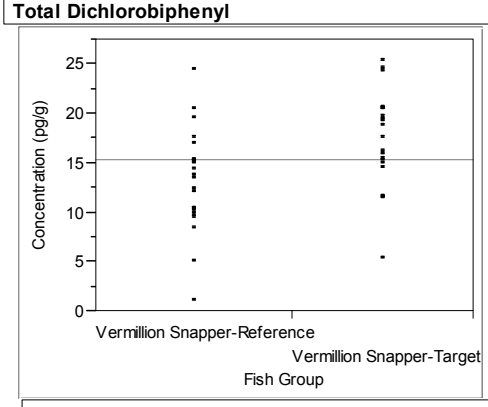
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
561.5	3.29941	0.0010

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
10.9694	1	0.0009

Total Dichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	360.5	16.3864	-2.821
Vermillion Snapper-Target	20	542.5	27.1250	2.821

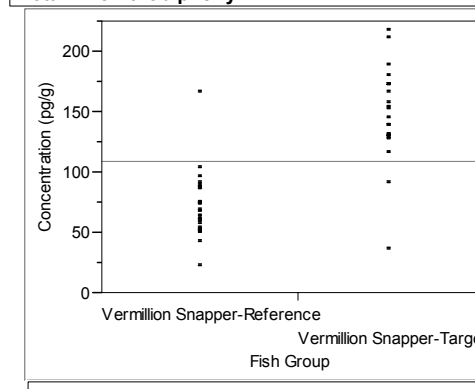
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
542.5	2.82110	0.0048

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
8.0298	1	0.0046

Total Trichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	288.5	13.1136	-4.634
Vermillion Snapper-Target	20	614.5	30.7250	4.634

2-Sample Test, Normal Approximation

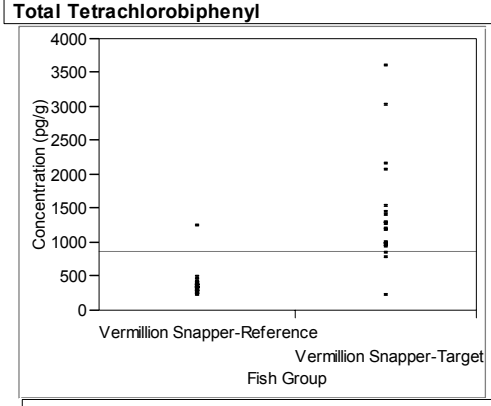
S	Z	Prob>|Z|
614.5	4.63429	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
21.5935	1	<.0001

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

Total Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	283	12.8636	-4.773
Vermillion Snapper-Target	20	620	31.0000	4.773

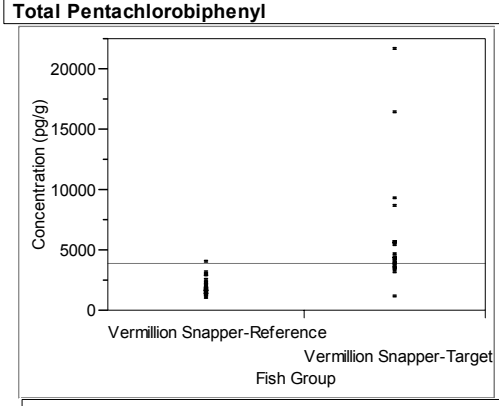
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
620	4.77281	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
22.9001	1	<.0001

Total Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	281.5	12.7955	-4.810
Vermillion Snapper-Target	20	621.5	31.0750	4.810

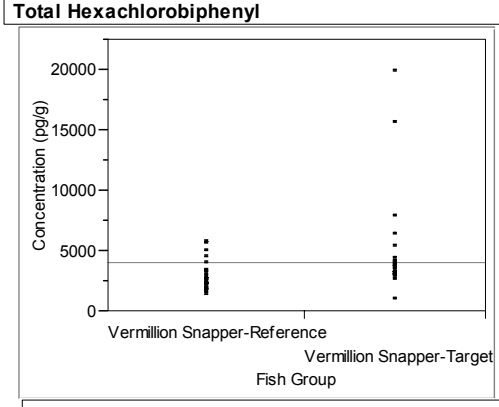
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
621.5	4.81040	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
23.2612	1	<.0001

Total Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	366	16.6364	-2.682
Vermillion Snapper-Target	20	537	26.8500	2.682

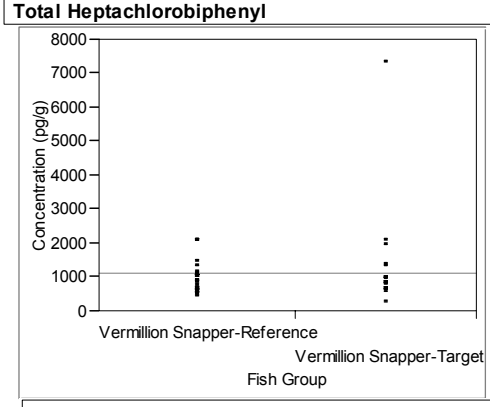
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
537	2.68213	0.0073

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
7.2615	1	0.0070

Total Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	464	21.0909	-0.214
Vermillion Snapper-Target	20	439	21.9500	0.214

2-Sample Test, Normal Approximation

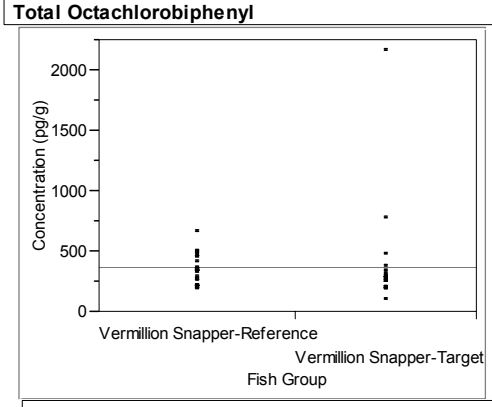
S	Z	Prob>|Z|
439	0.21408	0.8305

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.0514	1	0.8207

Results of Wilcoxon Rank Tests
Vermilion Snapper
Navy REEFEX Program

Total Octachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	526.5	23.9318	1.335
Vermillion Snapper-Target	20	376.5	18.8250	-1.335

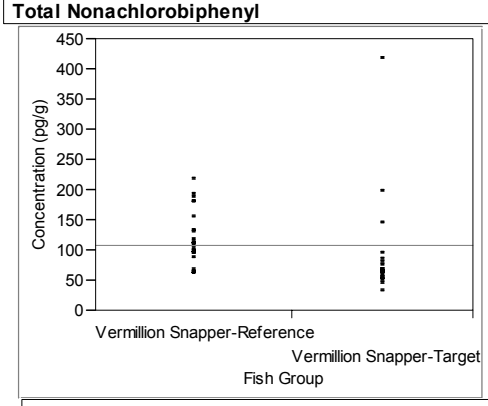
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
376.5	-1.33493	0.1819

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
1.8158	1	0.1778

Total Nonachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	597	27.1364	3.110
Vermillion Snapper-Target	20	306	15.3000	-3.110

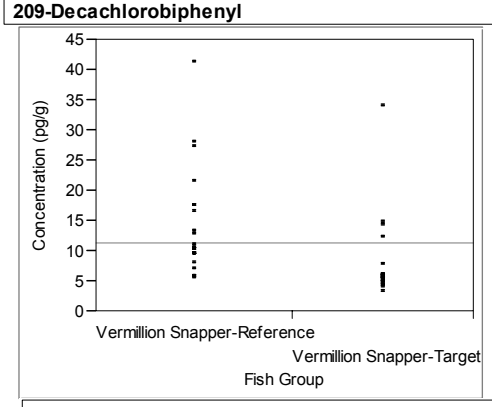
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
306	-3.11039	0.0019

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
9.7530	1	0.0018

209-Decachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	614	27.9091	3.539
Vermillion Snapper-Target	20	289	14.4500	-3.539

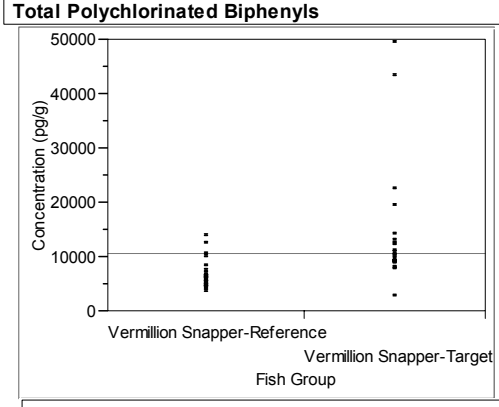
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
289	-3.53868	0.0004

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
12.6116	1	0.0004

Total Polychlorinated Biphenyls



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Vermillion Snapper-Reference	22	320	14.5455	-3.841
Vermillion Snapper-Target	20	583	29.1500	3.841

2-Sample Test, Normal Approximation

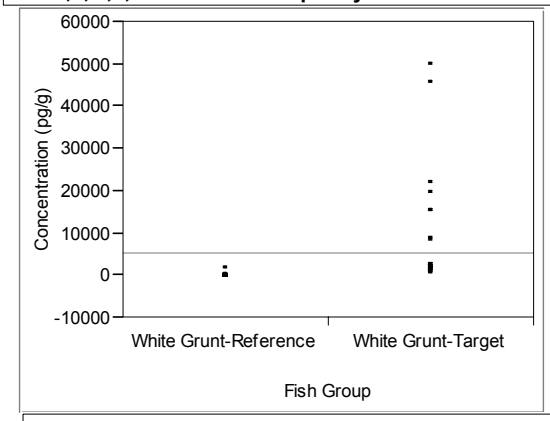
S	Z	Prob>|Z|
583	3.84076	0.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
14.8483	1	0.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

105-2,3,3',4,4'-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	216	10.8000	-5.234
White Grunt-Target	20	604	30.2000	5.234

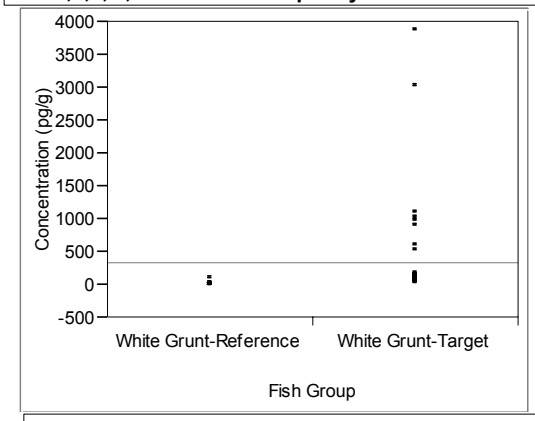
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
604	5.23444	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.5411	1	<.0001

114-2,3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	216	10.8000	-5.234
White Grunt-Target	20	604	30.2000	5.234

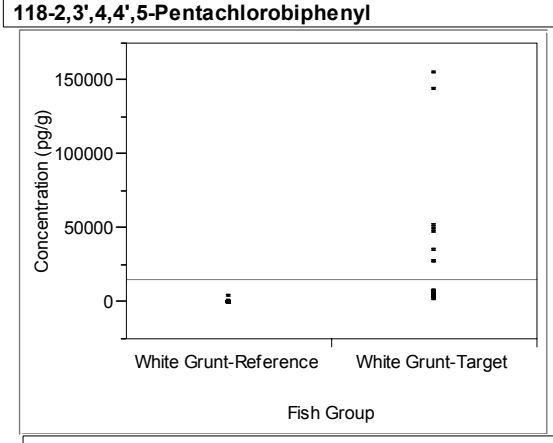
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
604	5.23419	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.5385	1	<.0001

118-2,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	216	10.8000	-5.234
White Grunt-Target	20	604	30.2000	5.234

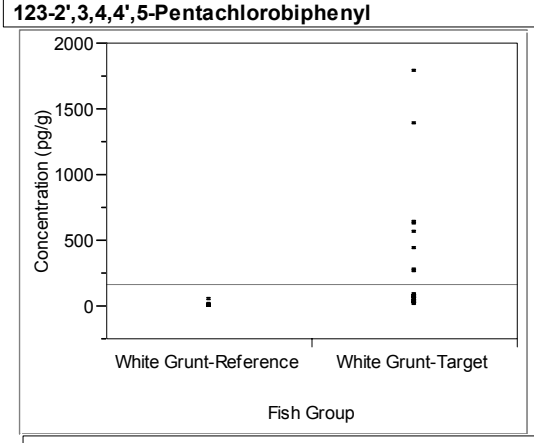
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
604	5.23444	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.5411	1	<.0001

123-2',3,4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	217	10.8500	-5.207
White Grunt-Target	20	603	30.1500	5.207

2-Sample Test, Normal Approximation

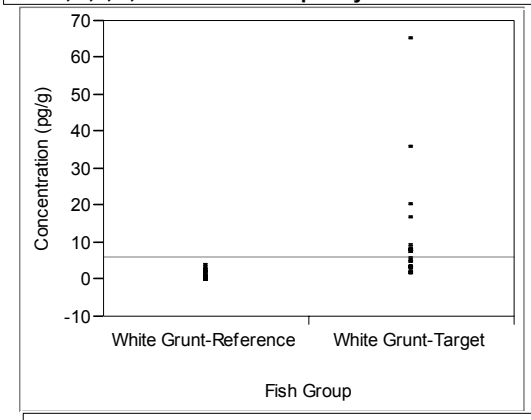
S	Z	Prob>|Z|
603	5.20714	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.2554	1	<.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

126-3,3',4,4',5-Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	227	11.3500	-4.937
White Grunt-Target	20	593	29.6500	4.937

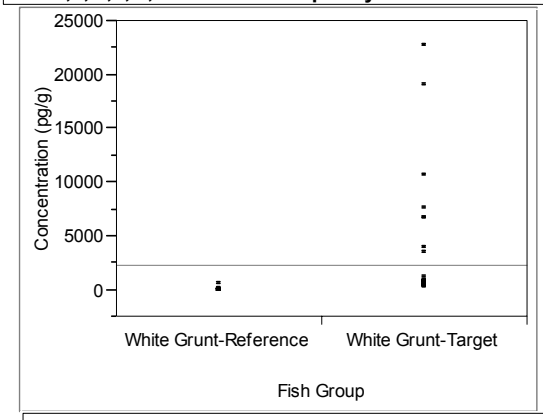
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
593	4.93664	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
24.5041	1	<.0001

156-2,3,3',4,4',5-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	217	10.8500	-5.207
White Grunt-Target	20	603	30.1500	5.207

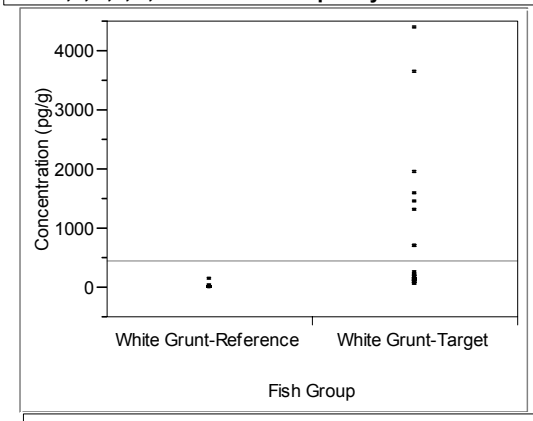
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
603	5.20714	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.2554	1	<.0001

157-2,3,3',4,4',5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	217	10.8500	-5.207
White Grunt-Target	20	603	30.1500	5.207

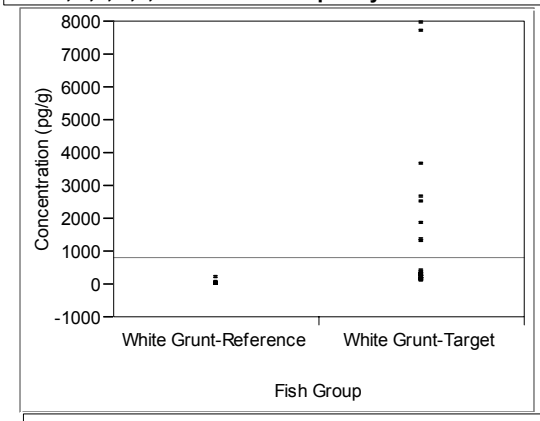
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
603	5.20714	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.2554	1	<.0001

167-2,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	217	10.8500	-5.207
White Grunt-Target	20	603	30.1500	5.207

2-Sample Test, Normal Approximation

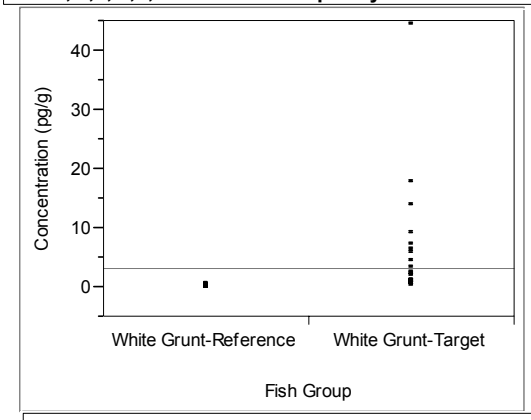
S	Z	Prob>|Z|
603	5.20714	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.2554	1	<.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

169-3,3',4,4',5,5'-Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	215	10.7500	-5.261
White Grunt-Target	20	605	30.2500	5.261

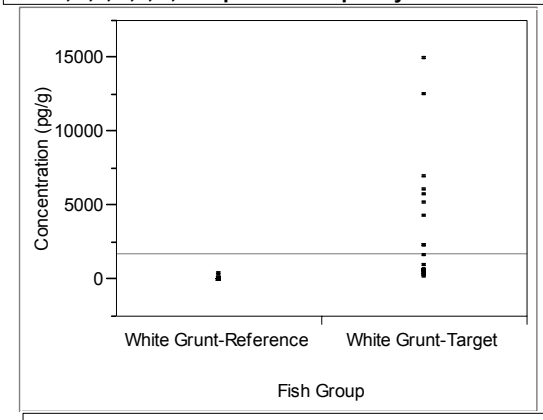
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
605	5.26124	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.8232	1	<.0001

170-2,2',3,3',4,4',5-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	214	10.7000	-5.288
White Grunt-Target	20	606	30.3000	5.288

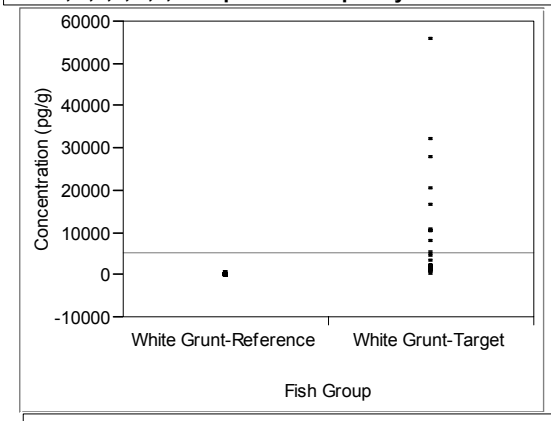
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
606	5.28829	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.1093	1	<.0001

180-2,2',3,4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	212	10.6000	-5.343
White Grunt-Target	20	608	30.4000	5.343

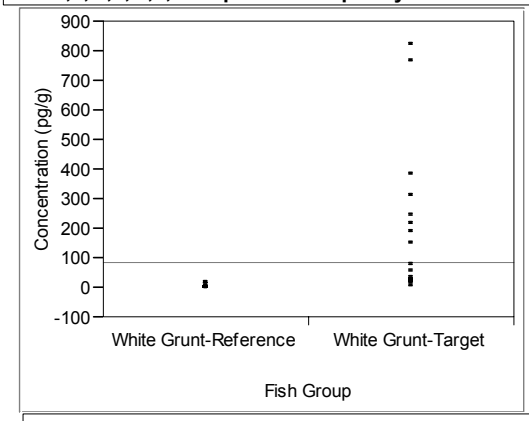
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
608	5.34264	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.6885	1	<.0001

189-2,3,3',4,4',5,5'-Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	213	10.6500	-5.316
White Grunt-Target	20	607	30.3500	5.316

2-Sample Test, Normal Approximation

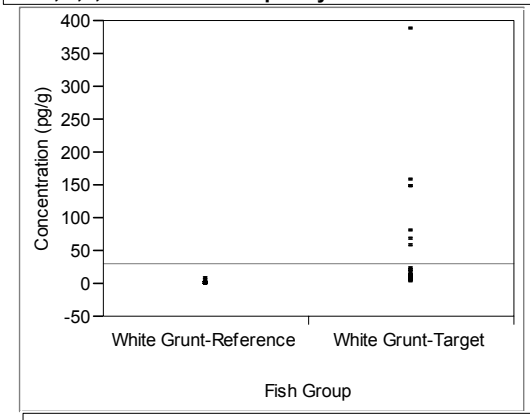
S	Z	Prob>|Z|
607	5.31559	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.3995	1	<.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

77-3,3',4,4'-Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	216	10.8000	-5.234
White Grunt-Target	20	604	30.2000	5.234

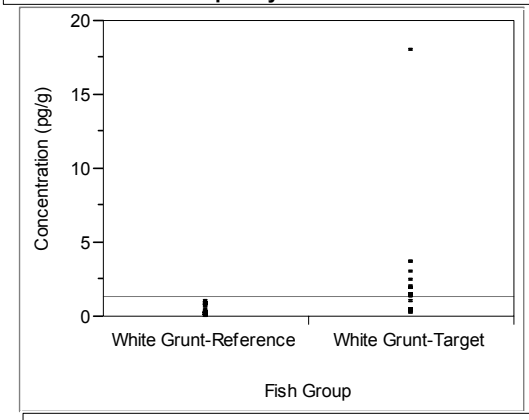
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
604	5.23419	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.5385	1	<.0001

Total Monochlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	244	12.2000	-4.477
White Grunt-Target	20	576	28.8000	4.477

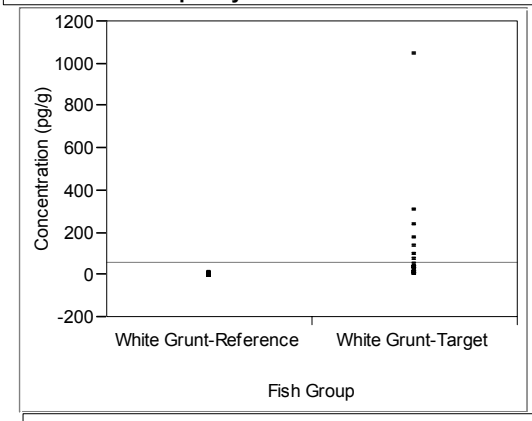
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
576	4.47700	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
20.1648	1	<.0001

Total Dichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	216	10.8000	-5.235
White Grunt-Target	20	604	30.2000	5.235

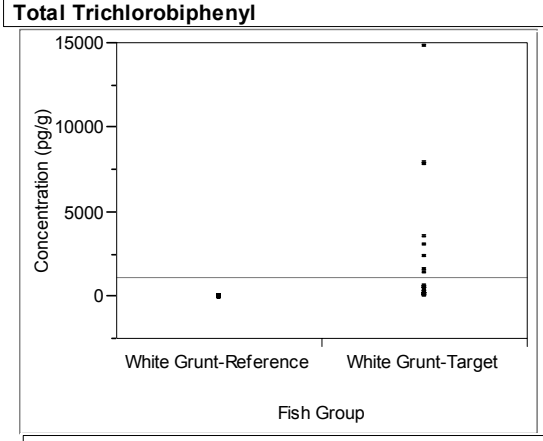
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
604	5.23468	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.5437	1	<.0001

Total Trichlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	210	10.5000	-5.397
White Grunt-Target	20	610	30.5000	5.397

2-Sample Test, Normal Approximation

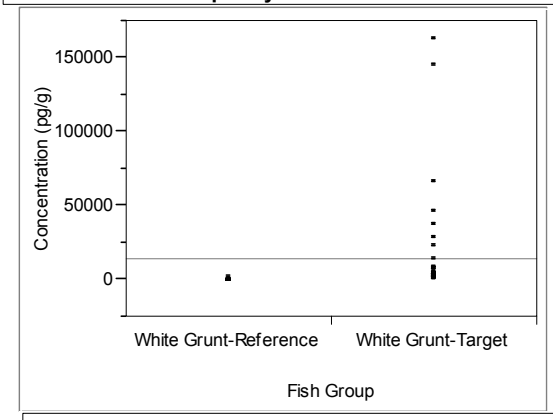
S	Z	Prob>|Z|
610	5.39675	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
29.2710	1	<.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

Total Tetrachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	213	10.6500	-5.315
White Grunt-Target	20	607	30.3500	5.315

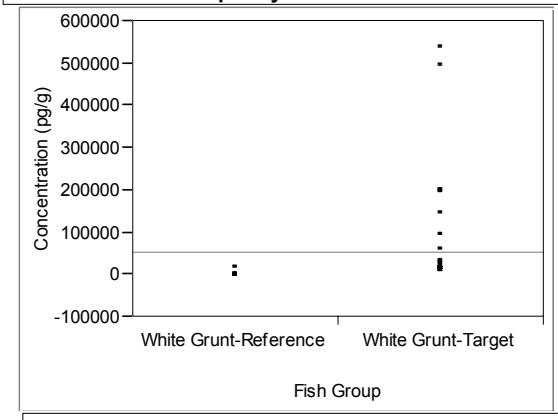
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
607	5.31534	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.3968	1	<.0001

Total Pentachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	217	10.8500	-5.207
White Grunt-Target	20	603	30.1500	5.207

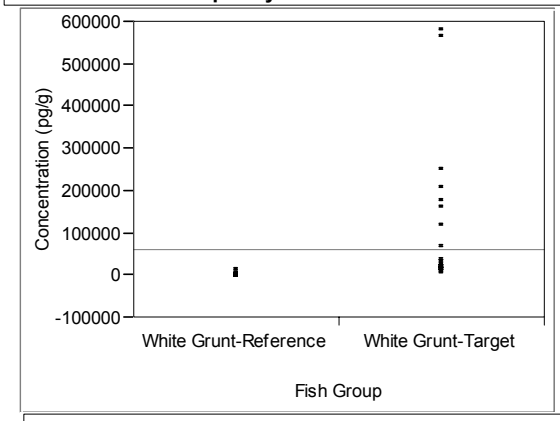
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
603	5.20739	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
27.2579	1	<.0001

Total Hexachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	213	10.6500	-5.316
White Grunt-Target	20	607	30.3500	5.316

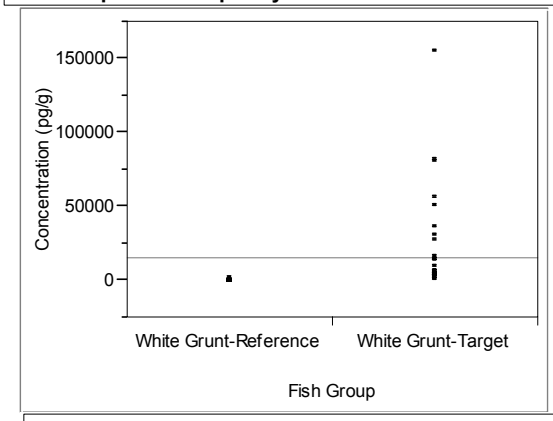
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
607	5.31559	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.3995	1	<.0001

Total Heptachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	212	10.6000	-5.342
White Grunt-Target	20	608	30.4000	5.342

2-Sample Test, Normal Approximation

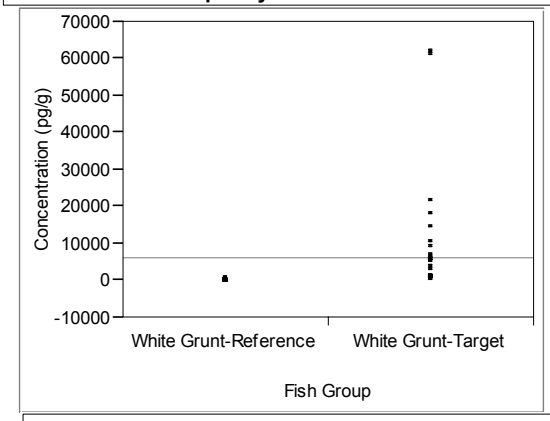
S	Z	Prob>|Z|
608	5.34239	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.6859	1	<.0001

Results of Wilcoxon Rank Tests
White Grunt
Navy REEFEX Program

Total Octachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	211	10.5500	-5.369
White Grunt-Target	20	609	30.4500	5.369

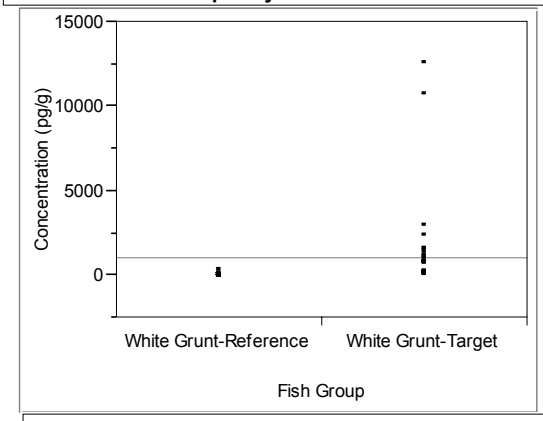
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
609	5.36944	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.9763	1	<.0001

Total Nonachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	221	11.0500	-5.099
White Grunt-Target	20	599	29.9500	5.099

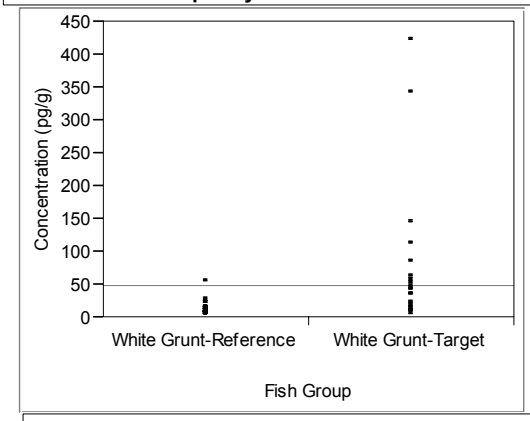
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
599	5.09894	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
26.1373	1	<.0001

209-Decachlorobiphenyl



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	268	13.4000	-3.828
White Grunt-Target	20	552	27.6000	3.828

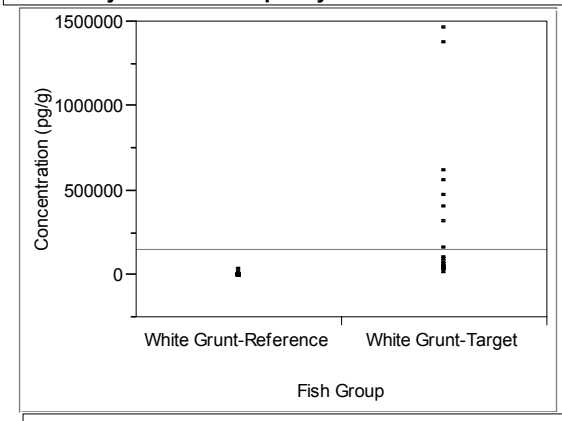
2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
552	3.82777	0.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
14.7555	1	0.0001

Total Polychlorinated Biphenyls



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
White Grunt-Reference	20	211	10.5500	-5.369
White Grunt-Target	20	609	30.4500	5.369

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
609	5.36944	<.0001

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
28.9763	1	<.0001

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY (USEPA) COMMENTS ON

Derivation of a Fraction Ingested Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina," prepared for the Navy by URS Corporation, dated June 24, 2003)

(NEHC, 5 September 2003)

COMMENT	RESPONSE
A. RESPONSE TO COMMENTS on "Derivation of FI Term" (June 24, 2003) document from Ms. Laura Casey, EPA (OPPT/NPCD)	
1. Background:	
• Please remove the phrase "TSCA office". If an office name or designation is needed, please use Office of Pollution Prevention and Toxics (OPPT)	Comment acknowledged. We apologize for the incorrect reference. We will reference your office appropriately, i.e. EPA (OPPT).
• Please provide details on how the survey was conducted: [For example]: - How were the fishing clubs chosen - nearness to the ex-Vermillion reef, a club favorite? - Why were clubs chosen over public marinas/docks? - How was the survey conducted? - Were the surveys handed out as fisherman entered the club, as they exited boats, were the surveys placed on a counter or bulletin board with a collection box? - How were the fisherman targeted, did the SCDNR randomly choose people? - Were charters chosen over private vessels and why? If so, did all the surveys take place on a specific charter trip?	Comment acknowledged. We requested additional information/details from SCDNR about how the survey was conducted. SCDNR, in collaboration with NEHC, developed a document entitled "Methods Used in Conducting a Fish Consumption Survey of South Carolina Marine Anglers that Fished the ex-VERMILLION Reef in 2001 or 2002" (SCDNR, 19 August 2003). A copy of the document is provided with this response as Addendum 2 to the *Revised Derivation of FI Term* document (URS, 5 September 2003). We believe this document provides answers to the questions you have asked.
2. Ex-VERMILLION Survey Results:	
• Pg 2, 1st paragraph: This paragraph indicated that 14 fishermen fished the ex-Vermillion, what was the total number of surveys collected?	The total number of surveys collected was 14. This is not, of course, the total number of SC marine anglers that likely fished the ex-VERMILLION in 2001 or 2002. Rather, it is a sampling of the individuals that fished this artificial reef. This was a targeted survey, where the survey taker tried to obtain as many surveys as possible, of SC marine anglers *that had fished the ex-VERMILLION*, within time constraints for conducting the survey. A well-known SC sports fishing club, that was known to meet once a month (the first Wednesday of the month), during the late spring and summer, was visited at the earliest possible date that could be arranged by the

COMMENT	RESPONSE
	survey taker (May 7th, 2003). Of 42 members present at the meeting, eight anglers verbally indicated that they had fished the ex-VERMILLION reef in 2001 or 2002. Surveys were conducted for each of these eight anglers. Then, on 17 May 2003 (a Saturday), the survey taker visited a large public marina where numerous marine anglers are present on weekends. There, an additional six surveys were completed (#9 thru #14). As described in more detail in the above-referenced SCDNR "Methods Used" document, at the club meeting, and marina, the survey taker verbally asked if any members/fishermen present had fished the ex-VERMILLION reef. Those that verbally responded in the affirmative were asked to complete the survey. No attempt was made to conduct surveys of anglers that verbally responded that they did NOT fish the ex-VERMILLION reef. However, we do have an estimate of the number of fishing club members that were contacted (and verbally asked whether they fished the ex-VERMILLION reef) and the number of fishermen contacted at the marina (and verbally asked whether they fished the ex-VERMILLION reef). The total number of people initially contacted by SCDNR (D. Hammond) was greater than 100. Of these, 14 anglers verbally indicated that they had fished the ex-VERMILLION reef in 2001 or 2002.
3. Types or Methods of Fishing	
• Pg 3, last paragraph: - Are there any thoughts as to why no grouper were caught? Is this unusual? -- Wasn't the grouper chosen as a study specie because it was commonly found and caught on the ex-Vermillion reef?	We have insufficient information about the fishing methods of SC anglers, or their success rate when fishing for grouper, to be able to definitively determine why the anglers who took the survey caught no grouper. We do know that four of the 13 surveyed anglers (31%) indicated that they only trolled for fish, rather than using bottom-fishing methods. Bottom-fishing methods are used to catch grouper. We did ask SCDNR marine biologists if they had any thoughts as to why no grouper were reported caught. Per SCDNR (M. Bell) email message dated 1 August 2003: "The only information from our two [fish catch] surveys related to grouper catches on artificial reefs is found in the 1992 survey. When anglers were asked about the two most common species caught on reefs in 1991, grouper tied for tenth place, along with trout. Grouper are a highly desirable near shore to offshore bottom fish that associate with hard bottoms and artificial reefs. But they are often difficult to catch, and require a higher degree of fishing skill, knowledge and luck than other species."

COMMENT	RESPONSE
	With regard to why grouper were initially chosen as a study specie: During the REEFEX Technical Working Group meetings, we deferred to SCDNR to provide information about the species commonly found or caught on the ex-VERMILLION reef. SCDNR recommended grouper as one of study specie based on SCDNR fish catch data, i.e. that grouper was a common catch, as well as SCDNR divers' visual observation of grouper in the vicinity of the ex-VERMILLION reef. Grouper were also attractive study specie because they tend to be territorial. During the fish sampling events for REEFEX, SCDNR personnel were unable to catch sufficient grouper of legal size either in the area of the ex-VERMILLION, or the natural reef used as a reference area. SCDNR noted that the grouper seemed to be more elusive than had been anticipated and that only a small number of grouper of legal size were even observed during these sampling events. SCDNR had intended to use spear-fishing methods, to obtain grouper samples, in addition to fish traps. Grouper were intentionally included on the fish consumption survey because they had been one of our choices of study specie for REEFEX. The results of this survey (grouper not reported caught) appear to be consistent with the inability to collect sufficient grouper, during the fish sampling events for REEFEX. SCDNR (M. Bell) email message, dated 1 August 2003, additionally notes: "[SCDNR] interest in grouper was sparked by their presence as a high-level predator on the reefs, their known presence and their desirability as a sport fish. We did see legal size fish on both the ex-VERMILLION and the reference reef, but were unable to bring them back in sufficient numbers to allow them to be used in the study."
4. Survey #10	
• In addition to the possible misunderstanding of the questions or misreporting of the data, the fisherman interviewed also indicated that he did not fish on the Vermillion reef in 2001 or 2002; therefore the surveyor should not have continued the survey based on the instructions below question 1.	We agree with your comment. Thank you for noting this. The second question on the survey, "Did you sometimes fish on the ex-VERMILLION in 2001 or 2002?" was a verification question. Given that the survey taker surveyed only those anglers that had verbally responded in the affirmative (that they had fished the ex-VERMILLION), all those who completed the survey should have answered "yes" to the second question, if they had understood the verbal question of the survey taker. As it turns out, this survey respondent (survey #10) answered "no" to this question, which means that the results of

COMMENT	RESPONSE
	that survey should not be included in any analysis of the data. Thus, inclusion of this verification question seems to have been a good idea. Survey #10 was already considered non-viable, and eliminated from the analysis, based on other inconsistencies noted in the respondent's answers. We will note this discrepancy, i.e., that the fisherman reported that he did not fish the ex-VERMILLION, in the text of the report and in the footnote referring to the elimination of Survey #10 from the dataset.
B. RESPONSE TO COMMENTS on "Derivation of FI Term" (June 24, 2003) document from Dr. Linda Phillips, Versar, Inc.	
1. Estimation of the Fraction Ingested Term	
• Note that the *average* FI was calculated from the data from 13 survey forms using several different mathematical approaches, all giving very similar *average values*. These average values were also similar to the initially suggested value of 0.10. Thus, 0.10 was suggested as the FI term that would be used in the human health risk assessment. - A 95th percentile value should be used in estimating the reasonable maximum exposure.	As noted in the comment, the proposed FI term was derived using average values instead of upperbound values. This approach was used to insure that the estimated reasonable maximum exposure (RME) intake value was still within the reasonably anticipated upperbound range, particularly since the ingestion rate already incorporates upperbound assumptions about the amount of fish ingested. Based on the discussion presented in RAGS, the RME is typically developed using a combination of mid-range and upperbound exposure parameters in order to prevent the RME intake from being overly conservative. Exhibit 6-17 of RAGS gives an example risk calculation for fish and shellfish ingestion that incorporates an FI term. As noted in the footnote to this exhibit, upperbound values are recommended for three of the exposure parameters (ingestion rate, exposure frequency, and exposure duration). This approach was used in the REEFEX risk assessment.
2. Fish Ingestion Rate	
• For the purposes of the REEFEX human health risk assessment, an IR_{fish} value of 4.7 g/day has been proposed. This value is the average *marine finfish* ingestion rate for the South Atlantic Region (see EPA's Exposure Factors Handbook, Table 10-52). - Note, however, that the FI term calculated [as described in the document reviewed] reflects the portion of *total fish and shellfish* meals that originates from resident fish from the Vermillion (i.e., not just the portion of total marine finfish meals that originates from the Vermillion). - Presumably 'total fish and shellfish' includes both marine and freshwater species since restaurant meals, takeout, and home-prepared meals are included.	Comment acknowledged. We agree with your comment that, given the non-specificity of the question asked in the Fish Consumption Survey, "How many fish/shellfish meals do you estimate you eat per year from other sources, such as restaurants, take-out, etc.", one must assume that the "total number of meals" includes fish and shellfish meals from all sources – marine, estuarine, and freshwater. And we had to think about the appropriateness of the FI term that had been derived using this value in the denominator. It is acknowledged that the derived FI term presented in the June 24, 2003 document was insufficient for the use for which it was originally intended, i.e., to be used in combination with the Marine Finfish Ingestion Rate (IR) values for the South Atlantic region.

COMMENT	RESPONSE
It also includes shellfish, as the term implies. Thus, the FI term actually represents the ratio of Vermillion finfish to all finfish and shellfish (marine and freshwater) that are consumed. - It may therefore not be appropriate to use the marine finfish ingestion rate of 4.7 g/day in the human health risk assessment because this value is not consistent with the FI term. Because the denominator of the calculation for the FI term was *all fish and shellfish*, the ingestion rate should also represent all finfish and shellfish. - EPA's Exposure Factors Handbook provides an ingestion rate for *all fish* (i.e., marine and freshwater finfish and shellfish) of 20.1 g/day (see Table 10-7) for the U.S. population. There is no breakdown by region. - In the absence of regional information, this may be an appropriate IR_{fish} term for this assessment.	Since the exposure scenario assumed in the REEFEX HHRA is the ingestion of marine finfish caught on the ex-VERMILLION reef (as compared to exposure from ingestion of marine finfish caught on natural reefs), a FI term specific to marine anglers which fish the ex-VERMILLION reef, used in conjunction with an IR value which is specific for the consumption of marine finfish in the South Atlantic region, is considered to be appropriate. Therefore, we have derived an alternate FI term, specific to ingestion of marine finfish (FI_{MFF}). Because the Fish Consumption Survey did not capture the total number of *marine finfish* meals that SC anglers consume from all sources, it was necessary to use other sources of information to derive this FI_{MFF} value. The published values in the USEPA Exposure Factors Handbook (Table 10-52 and section 10.10.1) were used to estimate the total number of marine finfish meals consumed by year in the South Atlantic region. Using this value in the denominator, and the number of finfish meals that anglers reported were caught and consumed from the ex-VERMILLION reef (from the SCDNR Fish Consumption Survey), we derived a site-specific, marine finfish-specific FI value. This value can be used in combination with the IR values for marine finfish consumption specific for the South Atlantic region that are published in the USEPA Exposure Factors Handbook. The derivation of this marine finfish-specific FI value is described in Addendum 1 to the *Revised Derivation of FI Term* document (URS, 5 September 2003).
3. Uncertainty Associated with the derived FI Term	
• Another uncertainty associated with the FI term, as described above, is that it represents only the fraction of fish that comes from the ex-VERMILLION, and not other artificial reefs. If additional reefs are created in the vicinity of the ex-VERMILLION, it is possible that the fraction of a person's intake that comes from reef fish may increase. This is an important consideration if the conditions at this site are intended to be representative of artificial reefs in general. • This uncertainty should be acknowledged in the human health risk assessment.	We agree with your comment, and will acknowledge this uncertainty in the risk assessment. In addition, the Navy is in the process of developing a Probabilistic Risk Assessment Model (PRAM) that could evaluate fish ingestion risks under various environmental exposure conditions and sources. It is recommended that this tool be considered in the future to address this potential concern.

Appendix I
NEHC's 15 November 2003 Response to EPA Comments on "Derivation of FI Term" Document (NEHC 2003e)

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY (USEPA) COMMENTS ON

"RESPONSE TO EPA COMMENTS ON "Derivation of FI Term" Document, Navy Environmental Health Center (23 September 2003)"

(NEHC, 15 November 2003)

COMMENT	RESPONSE
A. RESPONSE TO EPA COMMENTS ON "Derivation of FI Term" (October 7, 2003) Document from Ms. Laura Casey, EPA (OPPT/NPCD)	
1. Addendum 2: "Method Used in Conducting a Fish Consumption Survey on South Carolina Marine Anglers that Fished the ex-VERMILLION Reef in 2001 or 2002", D. Hammond, M. Bell, A. Lunsford, and C. Crane, 19 August 2003	
• Pg 3, Paragraph entitled "Surveys Conducted on 7 May 2003: Results of Florence Sportfishing Club Meeting": Mr. Hammond believed that members of this club would likely have a high number of anglers who might fish the ex-VERMILLION reef. How did Mr. Hammond reach this conclusion? Proximity to the reef? Personal knowledge?	Mr. Hammond reached this conclusion based on both his personal knowledge and members of the club in proximity to the reef. In an email sent by Mr. Mel Bell of SCDNR to Mr. Bill Wild, SPAWSYSCEN on 08 October 03, he commented that, "Don [Hammond] has been the primary, and most visible SCDNR liaison with the saltwater recreational fishing community in this state for the past 30 years. He is very knowledgeable of the habits of these anglers, and has constant contact with them through all of our fishing clubs as well as individually. The closest saltwater port to the membership of that club is Georgetown, SC, which is the closest port/inlet for accessing the Vermillion [ex-VERMILLION]." Mr. Bell further clarified the above response in a subsequent email to Mr. Bill Wild on 14 October 03: "SCDNR (primarily through Don [Hammond] and the Reef Program) keeps in regular contact with the few SW recreational fishing clubs we have in the state. It's not at all surprising to us that we have a pretty good handle on the fishing habits of these folks. We usually speak to all of the clubs once a year, and they are not shy about contacting us throughout the year about issues or concerns they have. They at least represent a known population of organized anglers we can interact with from time to time. It's the fishermen who do not belong to clubs that we have a need to query through occasional surveys to figure out what they are up to [explaining why SCDNR also conducted the survey at a large public marina, in addition to the survey conducted at the club]."
B. RESPONSE TO COMMENTS on "Review of the Navy's Response to Comments on the 'Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment" (October 7, 2003) Document from Dr. Linda Phillips, Versar, Inc.	
1. Estimation of the Fraction Ingested Term	
• I agree that a combination of mean and upper percentile values is typically used in estimating the RME. However, for the REEFEX HHRA, the Navy has recommended that an FI value based on 95th percentile data for intake rate and meal size (i.e., 0.1) be used in conjunction with the 95th percentile intake rate	We appreciate the comment that EPA has agreed with our marine-finfish specific revised FI term derivation methods (URS, September 5, 2003). In response to Dr. Phillips suggestions to slightly modifying the proposed FI term for the central tendency exposure (CTE) evaluation from 0.10 to 0.14, and the RME value from 1.0 to 1.l, we

COMMENT	RESPONSE
for the RME scenario. I believe that in this case, this is appropriate because the intake rate and FI term should be consistent. • However, for the central tendency scenario, the same FI term, based on the 95th percentile intake rate and meal size is also recommended….To ensure that there is consistency among the intake terms (i.e., IR and FI) used in the HHRA, it may be more appropriate to - Use 0.14 as the FI for the central tendency assessment - Use 0.10 (the value is actually 0.11, rounded to 2 significant figures from 0.106) for the RME	have determined that these suggested changes will not change the conclusions presented in the HHRA, i.e., there is no unacceptable risk or hazard. As such, the following approach is taken to finalize the HHRA: Summary of approach: Calculation tables, worksheets, etc. throughout the document would not be revised, but rather, we acknowledge in the executive summary and the uncertainty, conclusion, and recommendations section that there is uncertainty associated with the FI terms. We will identify the alternative values (CTE 0.14; RME 0.11), and discuss how using these values would not impact our conclusions. Specifically: - The section of the HHRA that discusses the FI Term (Section 5.2.4) will be revised to discuss how the FI Term was derived based on angler survey data. - The FI Term derivation document and associated angler surveys will be added to the HHRA as an appendix. - Text will be added in the uncertainties section discussing the impact of using an FI Term of 0.1 for both the RME and CTE evaluations vs. the values of 0.14 for CTE and 0.11 for RME. Specifically, this text will note how the angler survey data support the FI Term of 0.1 that was used, and how the minor difference between the various values would not have any impact on the conclusions of the HHRA. That is, whichever values are used, the HHRA would demonstrate no unacceptable risk or hazard. - The same text described above will be used in the revised executive summary. - A summary table will be generated to support the paragraph on uncertainties associated with the FI Terms. This summary table will show a side-by-side comparison of Hazard Indices and Cancer Risks associated with an FI Term of 0.1 vs. 0.14 (CTE) and 0.11 (RME). - A table will be generated that identifies all the specific changes from the July 2002 draft HHRA to this final HHRA (November 2003).
2. Fish Ingestion Rate	
• Response is acceptable. Because a marine-specific FI term has now been derived, it will be appropriate to retain the recommended marine fish ingestion rate in the HHRA.	Comment acknowledged. There will not be a change in the marine fish ingestion rate in the HHRA.
3. Uncertainty Associated with the derived FI Term	

COMMENT	RESPONSE
• Response is acceptable. Uncertainty should be included in HHRA.	We agree with your comment, and will acknowledge this uncertainty in the risk assessment. Specifically, - A paragraph will be added in the uncertainties section (Section 5.4.6) discussing how the specific findings of this HHRA are applicable to the ex-VERMILLION reef. Extrapolation of the findings to other artificial reefs is cautioned. We will state that the FI term represents only the fraction of fish that comes from the ex-VERMILLION, and not other artificial reefs. If additional reefs are created in the vicinity of the ex-VERMILLION, it may be appropriate to make adjustment on the FI term to take into account of a person's intake from the new reefs. We will also indicate that the Navy is in the process of developing a Probabilistic Risk Assessment Model (PRAM) that could evaluate fish ingestion risks under various environmental exposure conditions and sources. It is recommended that this tool be considered in the future to address this potential concern.

Appendix J
Revised Derivation of a Fraction Ingested (FI) Term For Use In The REEFEX Risk Assessment, Based on Marine Angler Survey Data From The ex-VERMILLION Reef, South Carolina" (URS, September 5, 2003) and Addendum Documents

Revised Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina

Prepared for
Navy Environmental Health Center

By
URS Corporation
September 5, 2003

INTRODUCTION

On June 30, 2003, the Department of the Navy (Navy) submitted to the U.S. Environmental Protection Agency (EPA) an initial evaluation of fish consumption data derived from a fish consumption survey conducted by the South Carolina Department of Natural Resources (SCDNR) in May 2003. The June 24, 2003 document[1] presented a derivation for a Fraction Ingested (FI) term intended for use in the REEFEX human health risk assessment (HHRA). On July 30, 2003 comments were received from Ms. Laura Casey of the EPA Office of Pollution Prevention and Toxics (EPA OPPT) and Dr. Linda Phillips of VERSAR (EPA OPPT contractor)[2]. To respond to the EPA comments, the Navy has revised the initial FI Term Derivation document, which is presented herein. In addition, two addendum documents are appended to this revised document to support responses to the EPA comments. Addendum 1 presents the derivation of a marine finfish ingestion-specific Fraction Ingested term ($\mathbf{FI_{MFF}}$) and Addendum 2 presents a detailed description of how SCDNR conducted the fish consumption survey.

BACKGROUND

Interest has been expressed by several coastal states in acquiring decommissioned U.S. Naval vessels for use in building artificial reefs. The anticipated benefits of building offshore reefs with former Naval vessels (REEFEX) include enhancing ecological resources by increasing the amount of productive hard-bottom habitat, using artificial reefs as marine protected and conservation areas, or using artificial reefs to provide alternative reefs for enhanced recreational fishing and diving opportunities so that natural hard-bottom reef communities can be better protected and conserved.[3]

Studies of decommissioned Naval vessels indicate that, even after routine decontamination of the vessels, residual levels of PCBs are likely to be present in some ship components. In order to address the feasibility of using these vessels in reef-

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[1] *Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina*, prepared for the Navy by URS Corporation, dated June 24, 2003.

[2] EPA OPPT (L. Casey). Email message dated July 30, 2003, Subj: "Fish Consumption Survey Comments."

[3] M. Bell, Marine artificial reefs. What is an Artificial Reef? South Carolina Department of Natural Resources, 2001. http://water.dnr.state.sc.us/marine/pub/seascience/artreef.html

building programs, a Technical Working Group (TWG) was established, consisting of representatives from the EPA, SCDNR, and the Navy. Potential risks associated with PCB contamination was one of the critical issues to be addressed by the TWG; specifically, whether use of decommissioned Navy vessels for reef building could pose potentially unacceptable risks to human health or the environment.

As part of the overall risk evaluation, a Draft Baseline Human Health Risk Assessment (the REEFEX HHRA) was performed[4], and submitted to members of the TWG for review. This risk assessment evaluated potential risks associated with ingestion of fish by recreational marine anglers who might fish an artificial reef. Fish were collected from a natural reef and a sunken Navy vessel, the ex-VERMILLION, located off the coast of South Carolina. Fish tissues were analyzed for PCBs, and risks evaluated for marine recreational angler populations. Members of the TWG reviewed the risk assessment and provided comments, both at the TWG meeting and subsequently, in written comments[5].

One key assumption of the human health risk assessment was that only a fraction (10 percent) of the fish ingested by South Carolina (SC) marine anglers would be expected to have originated from the ex-VERMILLION reef. This assumption was supported by survey information for marine angler populations over the entire state, which indicated that of the total number of days spent fishing on artificial reefs, only a fraction (3.7%) of those days were spent fishing the ex-VERMILLION reef [6]. However, the surveys did not capture fish consumption data for angler subpopulations that fished at artificial reefs. Comments received from VERSAR[7] observed that the Navy had based the Fraction Ingested (FI) value on market survey data that did not specifically address the amount of fish caught and consumed by marine anglers who fished the ex-VERMILLION reef. It was noted that it would be helpful if fish consumption data from anglers who were known to have fished the ex-VERMILLION reef could be obtained, in order to derive an FI value with less uncertainty.

In order to obtain this additional information, a fish consumption survey form was subsequently developed by the Navy Environmental Health Center (NEHC) to specifically identify marine anglers who fished the ex-VERMILLION reef and to determine their utilization of the fish caught from the reef (see Sample Survey Form attached to Addendum 2), as well as the overall fish consumption information for this subpopulation. SCDNR personnel conducted the surveys during May 2003 at a local fishing club and a frequently used public marina in SC. A detailed description of the survey methods used by SCDNR, and the results of their survey efforts is provided in the

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[4] U.S. Navy Environmental Health Center (NEHC). 2002. *A Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls (PCBs) from Sunken Vessels used as Artificial Reefs (Food Chain Scenario)*. *Draft*. July.

[5] EPA OPPT (L. Casey). Email message dated October 15, 2002, Subj: "HHRA Comments."

[6] R.J. Rhodes, M. Bell, and D. Liao, Office of Fisheries Management, Division of Marine Resources, Wildlife and Marine Resources Department, Charleston, SC, *Survey of Recreational Fishing Use of South Carolina's Marine Artificial Reefs by Private Boat Anglers*, Final report to the U.S. Fish and Wildlife Service, Project No. F-50, March 1994.

[7] VERSAR. Memorandum dated October 8, 2002 from Linda Phillips, VERSAR, to Laura Casey, EPA OPPT, titled *Review of REEFEX HHRA*.

document titled "Methods Used in Conducting a Fish Consumption Survey of South Carolina Marine Anglers that Fished the ex-VERMILLION Reef in 2001 or 2002"[8]. A copy of the SCDNR document is provided as Addendum 2 to this report.

This *Revised Derivation of a FI Term for Use in the REEFEX Risk Assessment* document provides a summary of the results of the fish consumption survey; a statistical evaluation of the results, a brief discussion of the strengths and weaknesses of the survey, and recommendations for a FI term which may be used in conjunction with published EPA ingestion rate values for fish and shellfish consumption. The document addresses EPA comments transmitted to the Navy on July 30, 2003, and provides addenda to document derivation of a marine finfish-specific FI term (FI_{MFF}) (Addendum 1), and the survey methods used by SCDNR in conducting the Fish Consumption Survey of SC marine anglers (Addendum 2).

EX-VERMILLION FISH CONSUMPTION SURVEY RESULTS

SCDNR conducted surveys of SC recreational marine anglers in May of 2003. During visits to a SC sports fishing club and a large SC public marina, the SCDNR survey taker verbally asked fishermen if they had fished the ex-VERMILLION reef in 2001 or 2002. Anglers who verbally indicated that they had not fished the ex-VERMILLION during the specified period were not surveyed. A total of fourteen anglers, of approximately 100 anglers contacted, verbally identified themselves as having fished the ex-VERMILLION reef during 2001 or 2002, and agreed to participate in a survey that was designed to determine their fish consumption patterns. These anglers were then surveyed regarding:

I. Whether or not they had fished in SC coastal waters during 2001 or 2002, and whether or not they had fished the ex-VERMILLION reef during 2001 or 2002 (verification questions);
II. The types or method of fishing conducted when they fished on or near the ex-VERMILLION reef;
III. The types (species) of fish caught; and
IV. The anglers' consumption of fish over the specified period (consumption of fish obtained from the ex-VERMILLION reef and consumption of fish and shellfish from other sources).

A total of 14 surveys were completed by the SCDNR survey taker. However, in one survey (Survey #10), the angler's recorded response to one of the verification questions (Survey question (I.b.), "Did you sometimes fish on the Vermillion reef in 2001 or 2002?") was "no". It is unknown if the question was not understood by the angler being surveyed, or whether the answer was inadvertently recorded wrongly. However, the recorded negative response required that Survey #10 be excluded from the dataset and from the subsequent evaluation of the survey data.

[8] See D. Hammond, M. Bell, A. Lunsford, and C. Crane. 2003. *Methods Used in Conducting a Fish Consumption Survey of South Carolina Anglers that Fished the ex-VERMILLION Reef in 2001 or 2002*. SCDNR, NEHC, and URS, 19 August 2003.

The results of the remaining 13 surveys of SC marine anglers are summarized in Table 1 of this document.

Types, or Methods of Fishing

All of the remaining surveys (the 13 viable surveys) have a response regarding the fishing methods used while fishing the ex-VERMILLION reef. In four of the thirteen surveys evaluated (31%) anglers reported that they bottom fished only; an additional four (31%) reported that they only trolled for fish; while five (38%) reported that they both trolled and bottom fished the ex-VERMILLION reef.

Types of Fish Caught

In addition to those fish species specifically identified on the survey, which were previously identified as potentially associated with the reef (black sea bass, grouper, white grunt, and vermilion snapper) several other species were also reported caught over or near the ex-VERMILLION reef by the responding anglers:

- Cigar minnows or scads (*Decapterus* sp.) – oceanic members of the jack family, not long-term reef residents, but commonly associate with reef habitat(s)
- Red porgy (*Pagrus pagrus*) – generally associated with the deeper reefs of the continental shelf feeding on shellfish – young especially can be found on/around reef habitats such as the ex-VERMILLION
- King mackerel (*Scomberomorus cavalla*) – oceanic, but loosely associated with reef habitats as a seasonal transient species only
- Amberjack (*Scriola dumerili*) – oceanic jack, associated with reef habitats as seasonal transient species
- Bluefish (*Pomatomus saltatrix*) – pelagic, seasonal schooling fish not closely associated with reef habitats
- Dolphin (*Coryphaene hippurus*) – oceanic and not typically associated with reef habitats
- Barracuda (*Sphyraene barracuda*) – open ocean predator, generally associated with reef habitats as a seasonal resident or transient species – not commonly consumed by anglers

While grouper were previously identified as potentially associated with the ex-VERMILLION reef, the marine anglers who were surveyed and indicated they had fished in the area of the reef reportedly caught no grouper[9]. A total of ten fish species were identified as being caught. Of these ten, four are potentially associated with the reef, while the remainders are oceanic species with little or no connection with the reef itself.

[9] Per SCDNR (M. Bell) email message of August 1, 2003: "The only information from our two [fish catch] surveys related to grouper catches on artificial reefs is found in the 1992 survey. When anglers were asked about the two most common species caught on reefs in 1991, grouper tied for tenth place, along with trout. Grouper are a highly desirable near shore to offshore bottom fish that associate with hard bottoms and artificial reefs. But they are often difficult to catch, and require a higher degree of fishing skill, knowledge and luck than other species."

Additionally, barracuda is not generally considered an edible species. Thus in essence, there are only nine "edible" fish species identified as being fished for and caught in the vicinity of the ex-VERMILLION reef. Only a fraction of these species (4 out of 9 species) taken by those anglers fishing the ex-VERMILLION are likely to be resident species with potential for exposure to residual PCBs onboard the hulk.

Fish Consumption Patterns of ex-VERMILLION Anglers

Two of the thirteen respondents indicated they do not usually keep the fish they catch for consumption. An additional respondent who indicated that he/she usually keeps the fish caught related that not very much of the catch is actually consumed (< ¼ of the catch is eaten). The majority of the respondents (nine of thirteen, or 69%) reported consuming at least one-half or more of their catch. All but one respondent reported that they consumed commercially prepared fish in addition to those fish caught by angling and those purchased and prepared at home[10]. The number of meals of fish caught from the vicinity of the ex-VERMILLION reef are, for the majority of the surveys, significantly less than either the number of purchased (pre-prepared) or home-prepared meals. These data are graphically depicted in Figure 1.

An important feature of the reported meals of fish caught from the ex-VERMILLION reef area is salient here: many of the fish caught, as discussed above, have no real relationship with the reef itself. These oceanic species, such as the jacks, range widely; and while they may take a fish or two from the reef, they would not regularly feed upon those fish that are in contact with the ex-VERMILLION hulk and any PCBs associated with it. In essence, they are not ex-VERMILLION fish and should not be incorporated into an estimate of the FI term for ex-VERMILLION fish.

ESTIMATION OF A FRACTION-INGESTED TERM FOR FISH CONSUMPTION

Deterministic Estimate

A deterministic estimate of the ex-VERMILLION FI term, based on the results of the surveys, is presented in Table 2. For each survey, the total number of fish meals, based on the midpoint of the range checked (e.g., for a 3-5 meals per year response, 4 meals was used in the calculation), was set equal to the sum of the meals commercially pre-prepared (bought) and those meals prepared at home (commercially bought and caught fish). The number of meals of fish caught from the vicinity of the ex-VERMILLION reef (estimated as the midpoint of the range as reported in each survey) was then divided by the total number of fish meals to calculate a fraction ingested term.

This fraction, as discussed above, includes fish that are not truly associated with the ex-VERMILLION reef but includes open-water, oceanic, fish species. Using only that

[10] There is a slight discrepancy where this respondent (survey #5) states that no fish that were not prepared at home were consumed (IV-c), states that 1 to 2 meals of pre-prepared meals were consumed (IV-d).

fraction of species known[11] or assumed[12] to be directly associated with ex-VERMILLION reef to represent the distribution of fish species caught by each respondent, a final ex-VERMILLON FI term was calculated. This was accomplished by multiplying the fraction of fish caught from the vicinity of the reef by the fraction of fish directly associated with the reef for each survey. For example, 75% of the species caught by respondent #2 were species associated with the reef and 4 of the 17½ meals of fish consumed over the past year (22.9%) were of fish caught in the vicinity of the ex-VERMILLION. The FI term for fish resident to the ex-VERMILLION reef is calculated as 0.75 x 0.229, which equals 0.171 and represents the FI term for survey #2. This correction for fish that truly reside on the reef and are therefore potentially contaminated by the residual PCBs in the ex-VERMILLION hulk is especially germane since, while all of the anglers reportedly fished on or near the reef, some never consumed any fish potentially contaminated by the ex-VERMILLION PCB load (e.g. see surveys 9, 11, 12, and 13).

The average for all of the individual FI terms (the individual terms were calculated from each angler's specific responses) represents a central tendency point estimate for the FI, of 0.081 (Table 2). The 95% upper confidence limit for this point estimate is 0.143.

Probabilistic Estimate

To describe and quantify the variability inherent within the deterministic estimates a probabilistic estimation method was employed – the bootstrap. The bootstrap is a non-parametric re-sampling technique[13] that is useful in illustrating and quantifying the uncertainty of a point estimate for a parameter such as the FI[14] term without assuming any underlying distribution, mean, or standard deviation. A bootstrap can be illustrated as repeatedly flipping a coin to determine the chances of getting heads versus tails. If done enough times, the outcomes can be used to form a distribution, from which percentiles, representing probabilities can be obtained. Bootstrapping the FI terms based on each individual survey can be illustrated as throwing all of the data into a hat, pulling a value out, recording it, putting it back into the hat, shuffling the data, and pulling out another value (could be the same as the last one pulled), putting it back in the hat, and so on until 13 values (the data set sample size) are recorded and from which an average is derived.

[11] Those species identified within the human health risk assessment (sea bass, grunt, and snapper – only grouper is not included here as none were caught).

[12] The red porgy is a reef fish and as such should be assumed to be associated with reef from which it was caught – the ex-VERMILLION reef.

[13] Common re-sampling techniques include Monte-Carlo analysis, which is by definition a parametric (requiring an assumption of parameter distribution) bootstrap. The standard bootstrap, employed here does not require any distributional assumption.

[14] e.g., see Davidson, A.C., and D.V. Hinkley. 1997. *Bootstrap Methods and their Application*. Cambridge Series in Statistical and Probabilistic Mathematics. Cambridge University Press, Cambridge, UK or Warren-Hicks, W.J., and D.R.J. Moore. 1998. *Uncertainty Analysis in Ecological Risk Assessment*. Society of Environmental Toxicology and Chemistry, SETAC Press, Pensacola, FL.

This procedure of generating a "re-sampled" mean was repeated 10,000 times to develop a distribution of outcomes, which is presented in Figure 2. The 50th percentile, or the most likely outcome for the distribution of possible FI terms, is 0.0795 (rounded to 0.080). This value is essentially equal to the central tendency point estimate (0.081). The 95th percentile, which could be interpreted as a 95% upper confidence limit[15] for the FI term, is 0.128.

Probit Analysis

In addition to a deterministic FI term estimate and a probabilistic estimate of the variability associated with the point estimate, a second methodology was employed to assess the validity of the point estimate methodology. Where, if two different methods of data analysis have similar results, the confidence of the estimate is enhanced. This second methodology involved probability unit regression (probit analysis). Probit analysis is particularly well suited for categorical data expressed as percentages (e.g., describing frequencies[16]). It is most commonly associated with the evaluation of dose-response curves[17] but has application outside toxicology as a frequency analysis tool. What is particularly attractive for probit analysis is its direct prediction of probabilities, where the regression is based on probability versus category. The probit function is a fairly simple transformation that linearizes cumulative distribution percentages[18]. Transformations were accomplished using an Excel-based visual BASIC macro program and employed, when applicable, corrections for 100% and 0% responses[19].

The probit analysis performed here separately evaluated: (1) the total number of fish and shellfish meals consumed per year, (2) the yearly number of fish meals for all ex-VERMILLION fish (i.e., of fish caught on or near the reef), and (3) the yearly number of ex-VERMILLION reef-associated fish meals.

(1) Probit Analysis of Total Number of Fish and Shellfish Meals

Using the number of fish meals-per-year categories that were presented in the Fish Consumption Survey, and the number of respondents for each category, a cumulative frequency can be developed. For example:

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[15] e.g., see USEPA 2002. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites.* Office of Emergency and Remedial Response, US Environmental Protection Agency. Washington, DC. OSWER 9285.6-10.

[16] e.g., see Sokal, R.R., and F.J. Rohlf. 1981. *Biometry: The Principles and Practice of Statistics in Biological Research.* 2nd Edition. W.H. Freeman and Co., San Francisco, CA.

[17] e.g., see Cockerham, L.G., and B.S. Shane. 1994. *Basic Environmental Toxicology*. CRC Press, Boca Raton, FL.

[18] Abou, M.M., R.W. Sorrell, and C.C. Childers. 1986. A computer program in BASIC for determining probit and log-probit or log-it correlation for toxicology and biology. Bull. Environ. Contam. Toxicol. 36:242-249. (Integration based on the trapezoidal rule).

[19] Litchfield, J.T., Jr. and F. Wilcoxon. 1949. A simple method of evaluating dose-effect experiments. Pharmacol. Exp. Ther. 96:99-113.

# of Fish & Shellfish Meals per Year	1 to 2	3 to 5	5 to 7	10 to 13	13 to 16	16 to 24
# Pre-Prepared	1	2	3	0	0	7
# Home Prepared	0	1	0	4	1	7
Total	1	3	3	4	1	14
Cumulative Frequency	0.0385	0.1538	0.2692	0.4231	0.4615	1
Total Meals	2 to 4	6 to 10	10 to 14	20 to 26	26 to 32	32 to 48
Midpoint of Total Meals	3	8	12	23	29	40

The probit transformation of the cumulative frequencies can be regressed against the midpoint of the total number of meals to develop a probability curve for the number of yearly fish and shellfish meals. The results of such a regression are presented in Figure 3. The regression is statistically significant ($\alpha = 0.02$) and based on the r^2 value, approximately 87% of the variation within the number of meals consumed per year can be explained by the regression. Additionally, the visual fit of the regression to the observed values appears good. This probit regression suggests that there is 95% probability that the people responding to the survey ate 55.5 meals of fish and shellfish or less in the past year. There is a 50% probability that any given respondent ate 27.5 meals or less in the past year.

(2) Probit Analysis of Number of Fish Meals from the ex-VERMILLION Reef Area

Considering the total number of fish caught in the vicinity of the ex-VERMILLION and subsequently consumed, the following cumulative frequency, based on the survey results, was observed:

# of Fish Meals per Year	0	1 to 2	3 to 5	5 to 7	10 to 13	13 to 16	16 to 24
# ex-VERMILLION area	3	3	5	1	0	0	1
Cumulative Frequency	0.2308	0.4615	0.8462	0.9231	0.9231	0.9231	1
Midpoint of Meals	0	1.5	4	6	11.5	14.5	20

The probit regression of the cumulative frequency data for consumption of fish caught on or near the area of the ex-VERMILLION reef is presented as Figure 4. The regression is just barely statistically significant ($\alpha = 0.049$). The visual fit of the data is poor and the r^2 reveals that only about 66% of the variation within the data is explained by the regression. The regression suggests that there is a 95% probability that any given respondent consumed 13.1 meals of fish caught in the vicinity of the ex-VERMILLION reef in the past year and a 50% probability that any given respondent consumed 0.7 meals or less of these fish in the past year. As the regression appears poor, these probabilities should be considered crude estimates.

(3) Probit Analysis of Number of Fish Meals of ex-VERMILLION Reef-Associated Fish

The most important parameter here, however, is not the total number of fish meals of fish caught in the vicinity of the ex-VERMILLION reef but rather the number of meals of fish

that reside on the reef. To calculate the number of meals of fish directly associated with the ex-VERMILLION reef (*i.e.*, resident on the reef), the survey results for the number of meals for all fish caught from the vicinity of the ex-VERMILLION was multiplied by that fraction of fish species caught that could be considered residents of the reef, as was performed for the FI term point estimate procedure presented above:

Survey Number	Fraction Reef Fish of Total Fish Species	Total Number of Meals of All ex-VERMILLION Fish	Number of Meals of ex-VERMILLION Resident Fish
1	1	0	0
2	0.75	4	3
3	1	4	4
4	1	6	6
5	1	4	4
6	0.67	1.5	1
7	0.67	1.5	1
8	0.67	1.5	1
9	0	0	0
11	0	20	0
12	0	0	0
13	0	4	0
14	1	4	4

Converting these data to categories, a cumulative frequency was developed:

# of Meals per Year	0	1	2	3	4	5	6
Cumulative Frequency	0.3846	0.6154	0.6154	0.6923	0.9231	0.9231	1

The probit regression of these data is presented as Figure 5. The regression is highly significant ($\alpha < 0.001$) and the r^2 is 0.94, which suggests that 94% of the variation within the data set is explained by the regression. Visually, the regression fit to the observed data is also good. The regression predicts that there is a 95% probability that any given respondent consumed 5.3 meals of ex-VERMILLION resident fish in the past year and there is a 50% probability that any given respondent consumed 0.8 meals or less in the past year.

Results of Probit Regression Analyses

In summary, probit regression analyses have produced a series of estimates for the number of fish meals consumed by SC marine anglers during the year, based on the survey results.

- The total number of fish and shellfish meals consumed per year has a 95% probability of being 55.5 meals or less, and a 50% probability of being 27.5 meals or less.

- The total number of fish meals, of fish caught on or near the ex-VERMILLION reef (including non-reef fish caught in the vicinity of the reef) has a 95%

probability of being 13.1 meals per year or less, and a 50% probability of 0.67 meals or less.

- The number of fish meals, of fish residing on/directly associated with the ex-VERMILLION reef, has a 95% probability of being 5.3 or less, and a 50% probability of 0.8 meals or less.

Calculation of FI Term Based on Probit Regression Analysis

The above estimates can be used to calculate a FI term ($FI_{reef\ fish}$) for the fraction of fish expected to be consumed from the ex-VERMILLION reef, relative to total yearly fish and shellfish consumption. The salient estimate (most probable estimate) is based on the 95% probability for the number of meals consumed of fish directly associated with the reef (5.3 meals a year) divided by the 95% probability for the total number of fish and shellfish meals consumed in a year (55.5 meals). This results in an estimate of 0.0955 (0.096) for the $FI_{reef\ fish}$ term. Using the 50% probit estimates (an estimate of a median FI term), 27.5 total fish meals per year, and 0.8 meals per year of ex-VERMILLION reef fish, the $FI_{reef\ fish}$ term is estimated to be 0.029.

Comparison between FI Term Derivations

The probit estimates of the FI term appear lower than those calculated using the point estimate method. These probit estimates are made using probabilities derived from the fish consumption survey data, rather than the actual survey values. This complicates any direct comparison to the point estimate or probabilistic estimate of the FI term, yet close examination reveals some salient similarities. The deterministic point estimate evaluation reveals a median FI Term (see Table 2) of 0.0291. This is essentially the same value, and statistically the exact same value, as the probit regression estimate based on a probability of 50%, or median outcome, of 0.029.

Comparing the most probable outcome estimates, the FI term based on a 95% probability obtained from the probit regression (0.096) is in good agreement with the most likely FI term estimates based on the central tendency value in the deterministic analysis (0.081) and the 50^{th} percentile value in the probabilistic analysis (0.080). All three methods suggest that the most probable FI term for ex-VERMILLION fish consumption, as related to total yearly fish and shellfish consumption for SC anglers is from 0.080 to 0.096.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The lower and upper bounded range for the FI term estimates is from 0.029 (probit analysis of median ingestion rates) to 0.143 (95% upper confidence for the point estimate). As the probabilistic estimation method is the most statistically robust of the methods employed, the most probable FI term is 0.0795 (0.080) (the 50^{th} percentile value of the bootstrap analysis). All of the estimated FI terms, based on the SCDNR fish consumption survey data, are within less than an order of magnitude of each other.

Moreover, all of the estimated FI terms, based on the SCDNR fish consumption survey data, are within less than an order of magnitude of the FI value used in the REEFEX HHRA (0.1).

There is a degree of uncertainty, however as these estimates take the survey data at face value and are as such, only a fair representation of the survey data. The survey was limited in scope (occurred during one period of the year) and represents a small sampling (13 viable surveys).

Based on results presented herein, the most probable $FI_{reef\ fish}$ term is 0.0795 (0.080). This value is less than the FI value of 0.1 that was assumed in the REEFEX HHRA. Thus the use of a FI term of 0.1 in the risk assessment is considered conservative. A FI term of 0.10 continues to be recommended for use in the human health risk assessment of the ex-VERMILLION reef (REEFEX HHRA).

This $FI_{reef\ fish}$ term has been derived on the basis of site-specific information for recreational marine anglers who fish the ex-VERMILLION reef. The extrapolation of this FI term to other risk assessments of artificial reefs would need to be evaluated based on similarity, or dissimilarity to the exposure scenario presented by the ex-VERMILLION reef.

TABLE 1
SUMMARY OF ANGLER SURVEY RESULTS FOR THE EX-VERMILLION REEF

Survey Number	II. Types of Fishing Conducted			III. Types of Fish Caught						IV. Fish Consumption (Parts a, b, and c)								
										Keep fish to eat?		How much caught fish are eaten?				Eat fish not prepared at home? [2]	
	Bottom fished	Trolled	Bottom & Trolled	Black Sea Bass	Grouper	White grunt	Vermillion Snapper	Other Species	Additional Species taken while fishing the ex-VERMILLION[1]	YES - Usually Keep fish to eat	NO - Do not usually keep to eat	Almost all eaten	Most fish eaten (1/2 to 2/3)	Some fish eaten (<1/2)	NOT much (< 1/4)	YES	NO
1			X	X			X		-----		X				X	X	
2			X	X		X	X	X	Cigar minnows (Scads)	X			X			X	
3			X	X			X	X	Red porgy	X		X				X	
4	X						X		----	X			X			X	
5	X						X		----	X		X					X
6			X	X			X	X	King mackerel	X		X				X	
7			X	X			X	X	Bluefish	X		X				X	
8	X			X			X	X	King mackerel	X			X			X	
9		X						X	Amberjack, Bluefish, King mackerel	X					X	X	
11		X						X	Dolphin, King mackerel	X			X			X	
12		X						X	King mackerel, amberjack		X				X	X	
13		X						X	King mackerel, Dolphin, Great Barracuda	X				X		X	
14	X			X			X		----	X			X			X	

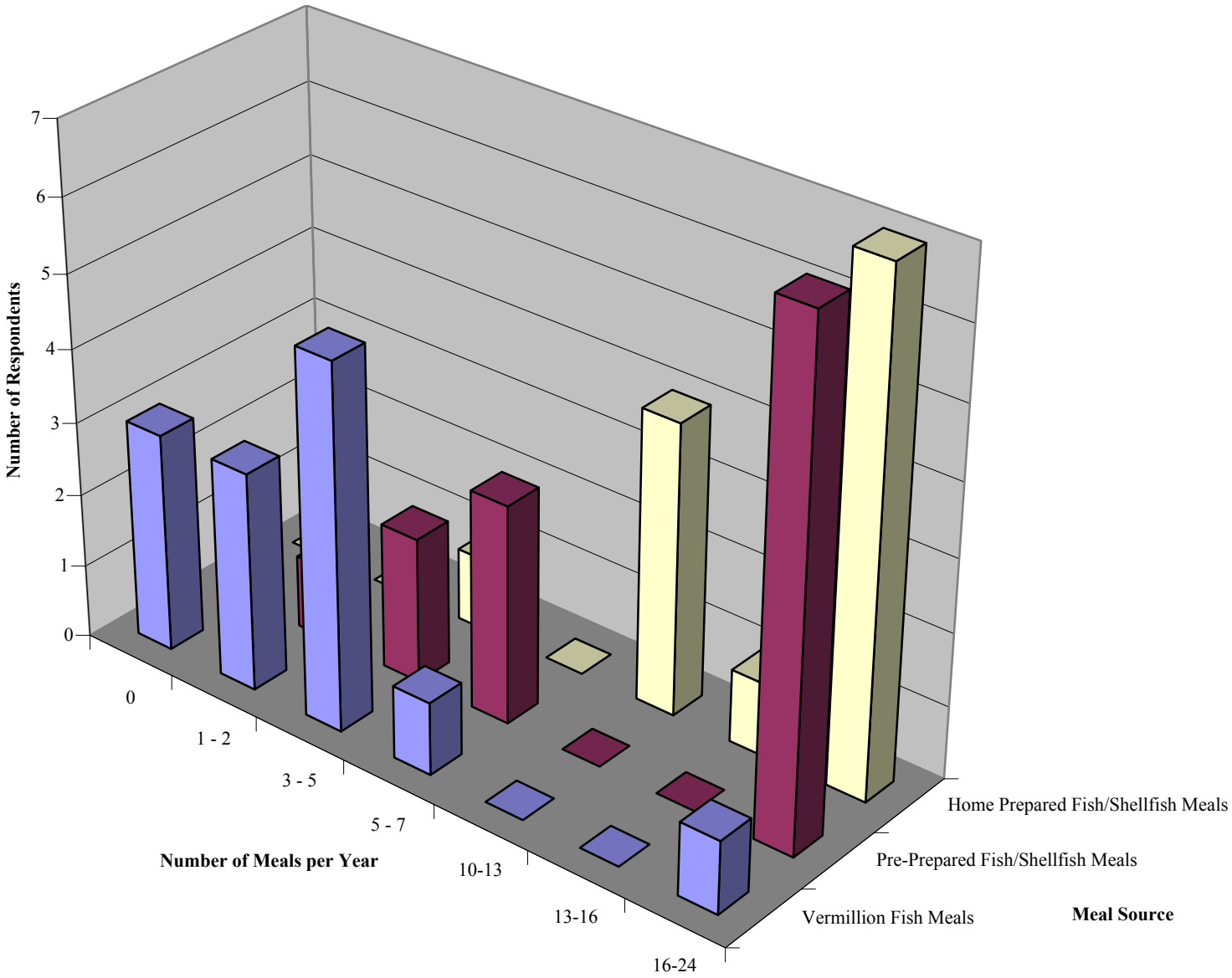
If a negative response to Survey Question I regarding whether the Ex-VERMILLION was fished in the past two years then no other questions were asked or recorded
Survey # 10 was censored from the data set
1 = Of the additional fish caught while fishing the Ex-VERMILLION only the red porgy is associated with reef habitats
2 = This refers fish eaten at restaurants, as take out, or bought pre-prepared at grocery stores
3 = This refers to fish caught angling and fish bought unprepared from markets
4 = This refers to just those fish caught in the vicinity of the Ex-VERMILLION reef and includes both oceanic and reef-associated species

TABLE 1
SUMMARY OF ANGLER SURVEY RESULTS FOR THE EX-VERMILLION REEF

Survey Number	IV. Fish Consumption (Parts d, e, and f)																									
	How many fish meals eaten that were not prepared at home? [2]							How many home-cooked fish meals? [3]							How many home-meals of Vermillion fish? [4]											
	0 meals per year	1 - 2 meals per year	3 - 5 meals per year	5 - 7 meals per year	10-13 meals per year	13-16 meals per year	16-24 meals per year	0 meals per year	1 - 2 meals per year	3 - 5 meals per year	5 - 7 meals per year	10-13 meals per year	13-16 meals per year	16-24 meals per year	0 meals per year	1 - 2 meals per year	3 - 5 meals per year	5 - 7 meals per year	10-13 meals per year	13-16 meals per year	16-24 meals per year					
1			X							X					X											
2				X								X					X									
3				X								X					X									
4							X							X				X								
5		X										X					X									
6				X										X		X										
7							X						X			X										
8							X							X		X										
9			X											X	X											
11							X							X												X
12							X					X			X											
13							X							X			X									
14							X							X			X									

If a negative response to Survey Question I regarding whether the ex-VERMILLION reef was fished in the past year, then the survey was excluded from the data set
Survey # 10 was censored from the data set because of a negative response to Question 1
1 = Of the additional fish caught while fishing the Ex-VERMILLION only the red porgy is associated with reef habitats
2 = This refers fish eaten at restaurants, as take out, or bought pre-prepared at grocery stores
3 = This refers to fish caught angling and fish bought unprepared from markets
4 = This refers to just those fish caught in the vicinity of the Ex-Vermillion reef and includes both oceanic and reef-associated species

FIGURE 1
DISTRIBUTION OF THE NUMBER OF FISH AND SHELLFISH MEALS CONSUMED PER YEAR



Ex-Vermillion fish meals represents a subset of the home prepared fish meals. These ex-Vermillion meals are not corrected for that fraction of fish associated with the reef and includes oceanic species. Total fish meals per year equals the sum of the pre-prepared meals and the home prepared meals.

TABLE 2
DETERMINISTIC ESTIMATE OF THE FRACTION INGESTED TERM FOR EX-VERMILLION FISH BASED ON THE TOTAL NUMBER OF FINFISH AND SHELLFISH MEALS PER YEAR

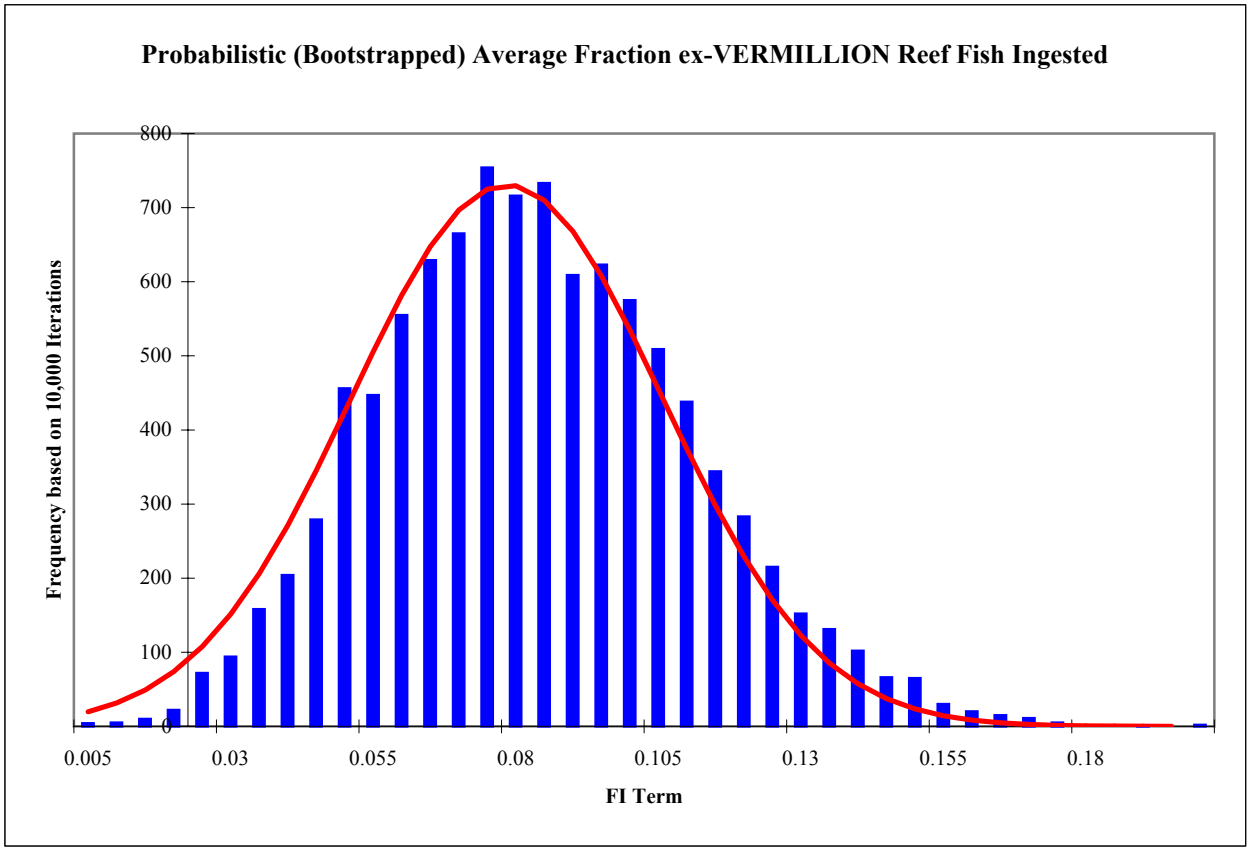
Survey Number	fraction ex-VERMILLION reef-associated fish caught	mid-point # prepared meals(finfish and shellfish)	mid-point # home prepared meals (finfish and shellfish)	mid-point ex-VERMILLION meals	Σ meals (finfish and shellfish) - year	fraction-ex-VERMILLION MEALS / Σ - meals	FI - ex-VERMILLION all finfish and shellfish (includes oceanic species)	FI - ex-VERMILLION reef fish of all finfish and shellfish meals
1	100%	4	4	0	17.5	0 / 17.5	0	0
2	75%	6	11.5	4	17.5	4 / 17.5	0.229	0.171
3	100%	6	11.5	4	17.5	4 / 17.5	0.229	0.229
4	100%	20	20	6	40	6 / 40	0.150	0.150
5	100%	1.5	11.5	4	13	4 / 13	0.308	0.308
6	67%	6	20	1.5	26	1.5 / 26	0.058	0.039
7	67%	20	14.5	1.5	34.5	1.5 / 34.5	0.043	0.029
8	67%	20	20	1.5	40	1.5 / 40	0.038	0.025
9	0%	4	20	0	24	0 / 24	0	0
11	0%	20	20	20	40	20 / 40	0.500	0
12	0%	20	11.5	0	31.5	0 / 31.5	0	0
13	0%	20	20	4	40	4 / 40	0.100	0
14	100%	20	20	4	40	4 / 40	0.100	0.100

$$FI = \left[\frac{Midpt_{-\text{exVermillion fish meals per year}}}{Midpt_{-\text{pre-prepared fish meals per year}} + Midpt_{-\text{home prepared fish meals per year}}} \right] \times f_{reef-fish}$$

Point Estimate of Fraction Ingested (FI) term for ex-VERMILLION reef fish

Mean	0.0808
Upper 95% Confidence Limit for the Mean	0.143
Standard Error	0.0285
Median	0.0291
Mode	0
Standard Deviation	0.103
Sample Variance	0.0106
Kurtosis	0.328
Skewness	1.17
Range	0.308
Minimum	0
Maximum	0.308
Sum	1.05
Count	13

FIGURE 2
PROBABILISTIC ESTIMATE OF THE FRACTION INGESTED TERM FOR EX-VERMILLION FISH BASED ON THE TOTAL NUMBER OF FISH AND SHELLFISH MEALS PER YEAR

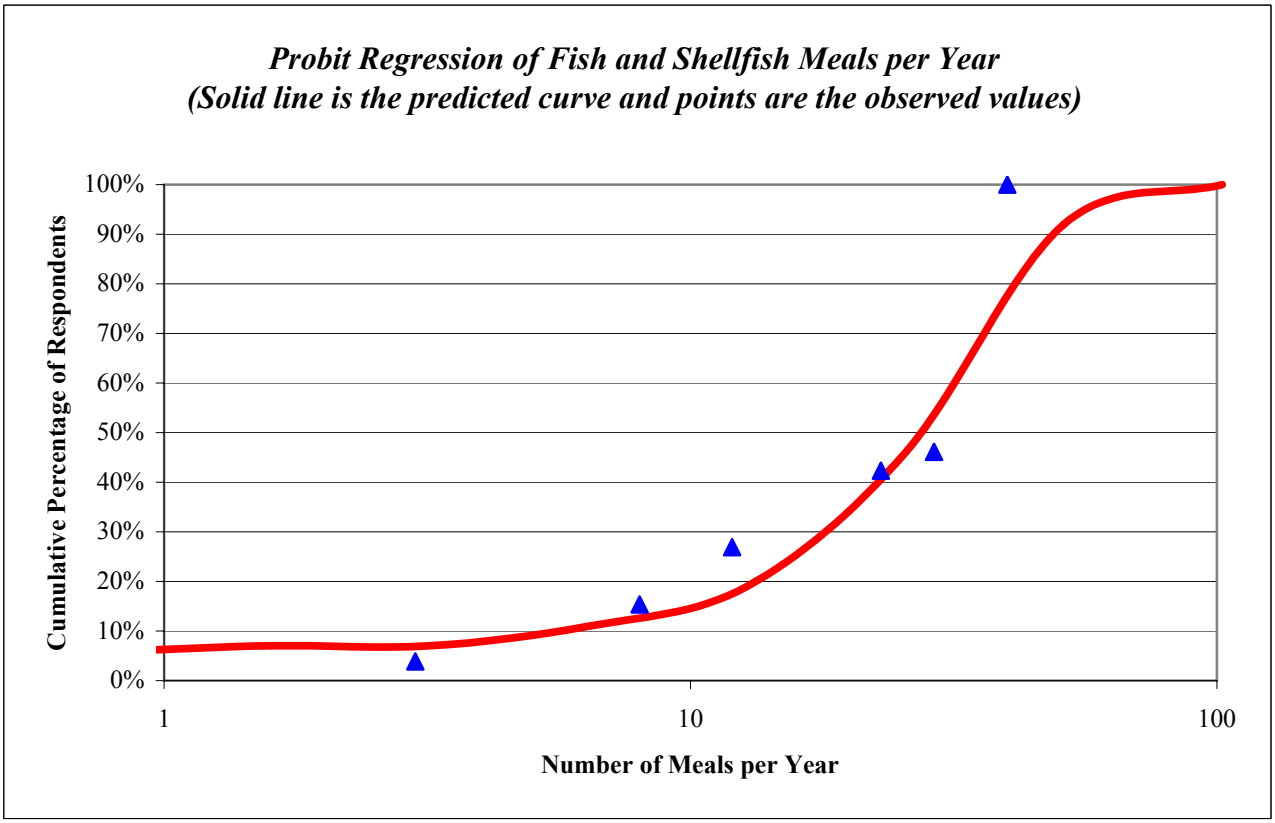


5th Percentile = 0.0385
10th Percentile = 0.0467
20th Percentile = 0.0573
30th Percentile = 0.0654
40th Percentile = 0.0727
50th Percentile = 0.0795
60th Percentile = 0.0866
70th Percentile = 0.0947
80th Percentile = 0.1036
90th Percentile = 0.1169
95th Percentile = 0.1282

Bars represent observed bootstrapped frequency while the solid line is based on the expected frequency assuming a normal distribution

$$FI = \left[\frac{Midpt_{-\text{exVermillion fish meals per year}}}{Midpt_{-\text{pre-prepared fish meals per year}} + Midpt_{-\text{home prepared fish meals per year}}} \right] \times f_{reef-fish}$$

FIGURE 3
PROBIT (PROBABILITY) REGRESSION ANALYSIS OF THE TOTAL NUMBER OF FISH AND SHELLFISH MEALS CONSUMED PER YEAR



Regression Statistics	
Multiple R	0.9304
R Square	0.8656
Observations	5

95% probability = 55.5 meals per year
50% probability = 27.5 meals per year

$$\text{Probit} = 3.375 + \left(0.05910 \times \frac{x - meals}{year}\right)$$

Analysis of Variance (ANOVA)

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	1.613890987	1.613890987	19.31806279	0.021826428
Residual	3	0.250629321	0.083543107		
Total	4	1.864520308			

Regression Coefficients	*Coefficients*	*Standard Error*	*t Statistic*	*Significance*	*Lower 95% Confidence Limit*	*Upperr 95% Confidence Limit*
Intercept	3.375021558	0.239572952	14.08765692	0.000774698	2.6125928	4.137450331
Number of Meals/Year	0.059103896	0.013447276	4.395231825	0.021826428	0.016308622	0.101899171

RESIDUAL OUTPUT

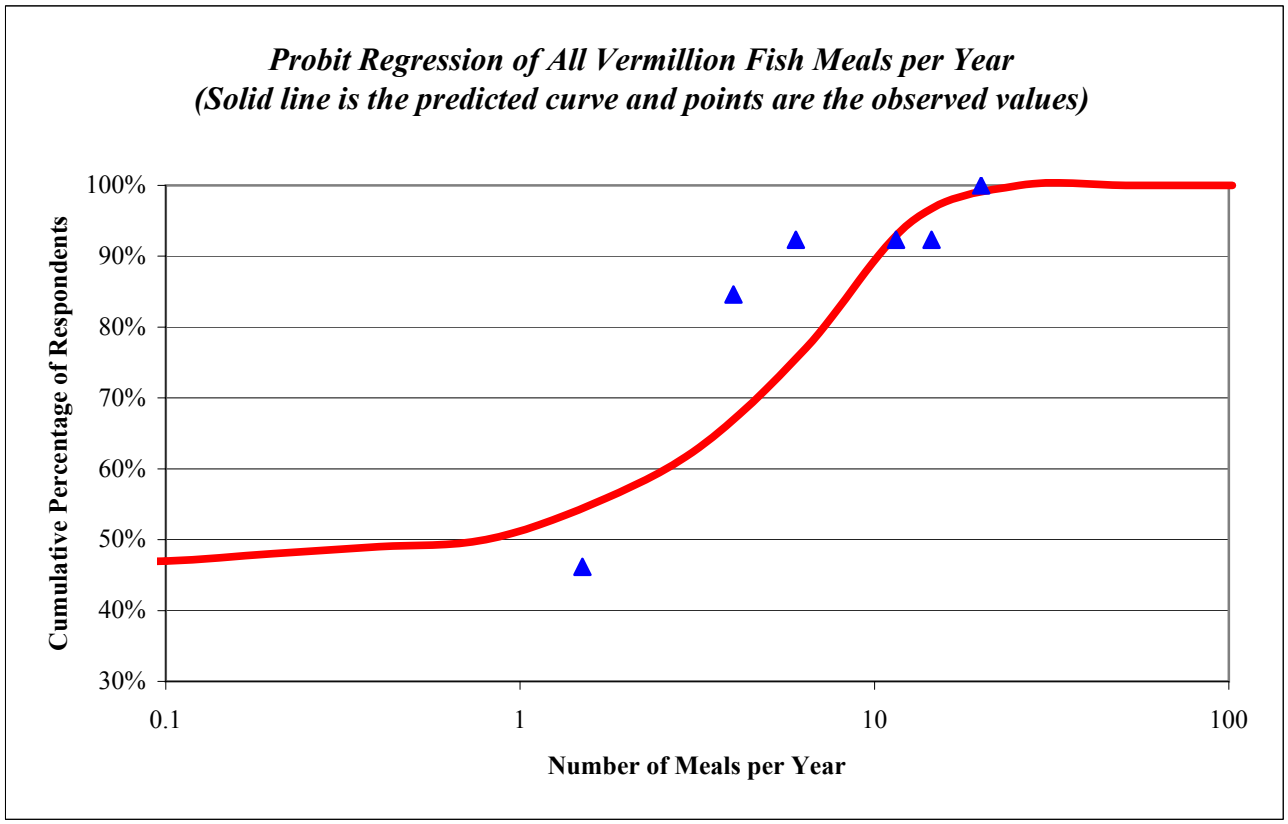
Observation	*Predicted Probit*	*Residuals*
1	3.552333247	-0.320633247
2	3.847852727	0.132547273
3	4.084268312	0.301131688
4	4.734411169	0.072288831
5	5.089034545	-0.185334545

Number responses (pre-prepared + home cooked)

Number responses	*Number of Meals/Year*	*Cumulative Frequency*	*Probit Value*
1	3	0.0385	3.2317
3	8	0.1538	3.9804
3	12	0.2692	4.3854
4	23	0.4231	4.8067
1	29	0.4615	4.9037
14	40	1.0000	6.5417

Total number Responses are for both home-cooked and pre-pared meals
Number of meals is the sum of the mid-point of the Responses

FIGURE 4
PROBIT (PROBABILITY) REGRESSION ANALYSIS OF THE NUMBER OF FISH MEALS PER YEAR OF ALL FISH CAUGHT IN THE VICINITY OF THE EX-VERMILLION REEF



Regression Statistics	
Multiple R	0.8132
R Square	0.6613
Observations	6

95% probability = 13.1 meals per year
50% probability = 0.67 meals per year

$$\text{Probit} = 4.911 + \left(0.1334 \times \frac{x - meals}{year}\right)$$

ANOVA

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	2.889607415	2.889607415	7.809510738	0.049083579
Residual	4	1.4800453	0.370011325		
Total	5	4.369652715			

Regression Coefficients	*Coefficients*	*Standard Error*	*t Statistic*	*Significance*	*Lower 95% Confidence Limit*	*Upperr 95% Confidence Limit*
Intercept	4.910992302	0.388177867	12.65139701	0.000224761	3.833235532	5.988749072
Number of Meals/Year	0.133401232	0.047736209	2.794550185	0.049083579	0.000863993	0.26593847

RESIDUAL OUTPUT

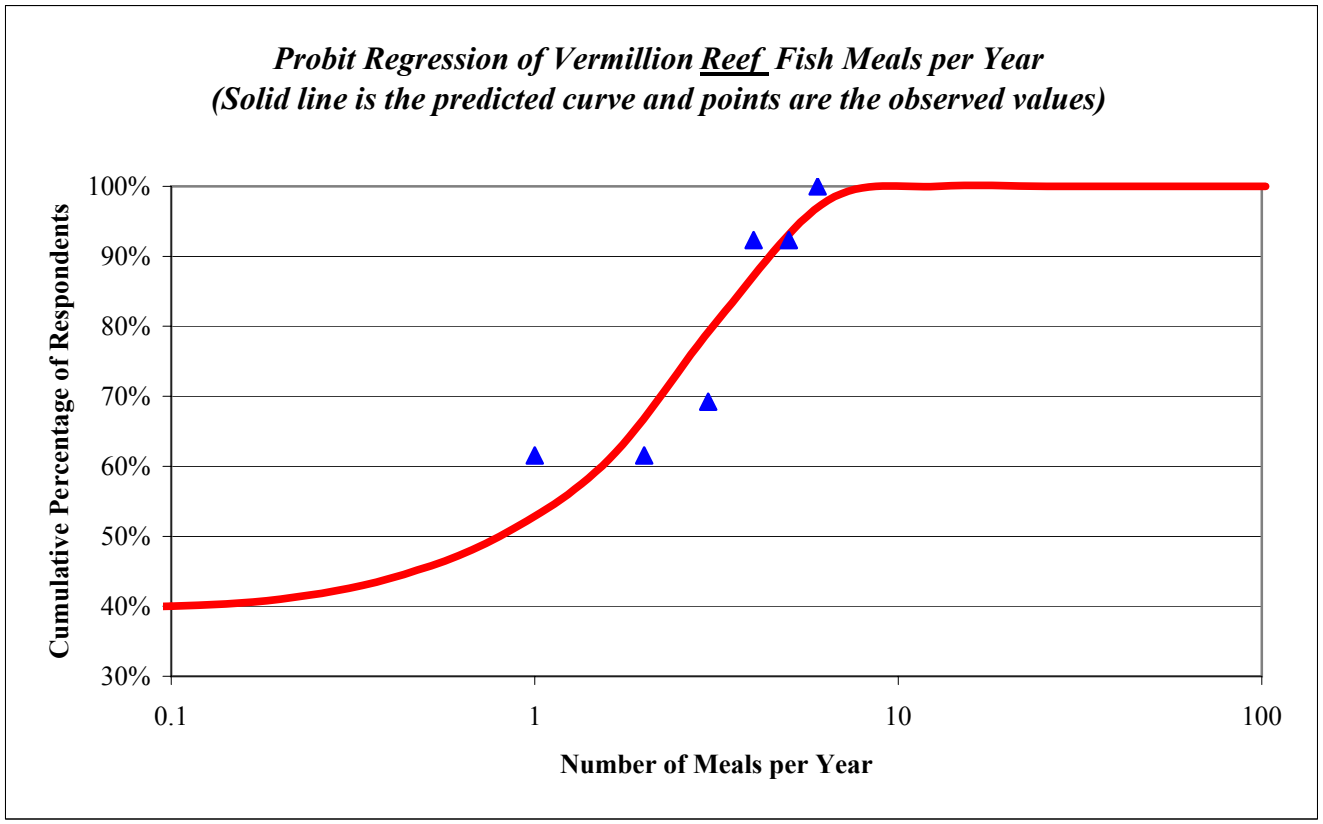
Observation	*Predicted Probit*	*Residuals*
1	4.910992302	-0.646592302
2	5.111094149	-0.207394149
3	5.444597229	0.576002771
4	5.711399692	0.715200308
5	6.445106467	-0.018506467
6	6.845310162	-0.418710162

Number responses
(all ex-VERMILLION caught fish - includes non-reef fish)

Number responses	*Number of Meals/Year*	*Cumulative Frequency*	*Probit Value*
3	0	0.2308	4.2644
3	1.5	0.4615	4.9037
5	4	0.8462	6.0206
1	6	0.9231	6.4266
0	11.5	0.9231	6.4266
0	14.5	0.9231	6.4266
1	20	1.0000	6.9936

Number of meals is the sum of the mid-point of the responses

FIGURE 5
PROBIT (PROBABILITY) REGRESSION ANALYSIS OF THE NUMBER OF FISH MEALS PER YEAR OF FISH DIRECTLY EXPOSED TO THE EX-VERMILLION REEF



Regression Statistics	
Multiple R	0.9687
R Square	0.9384
Observations	7

95% probability = 5.31 meals per year
50% probability = 0.80 meals per year

$$\text{Probit} = 4.708 + \left(0.3662 \times \frac{x - meals}{year}\right)$$

ANOVA

	df	*Sum of Squares*	*Mean Square*	*F*	*Significance F*
Regression	1	3.7558205	3.7558205	76.13881165	0.000327369
Residual	5	0.246642968	0.049328594		
Total	6	4.002463469			

Regression Coefficients	*Coefficients*	*Standard Error*	*t Statistic*	*Significance*	*Lower 95% Confidence Limit*	*Upperr 95% Confidence Limit*
Intercept	4.707875	0.151335922	31.108774	6.44307E-07	4.318854263	5.096895737
Number of Meals/Year	0.366246429	0.041973033	8.725755649	0.000327369	0.258351489	0.474141368

RESIDUAL OUTPUT

Observation	*Predicted Probit*	*Residuals*
1	4.707875	-0.000275
2	5.074121429	0.220178571
3	5.440367857	-0.146067857
4	5.806614286	-0.303314286
5	6.172860714	0.253739286
6	6.539107143	-0.112507143
7	6.905353571	0.088246429

Number responses
(only ex-VERMILLION resident fish - does not include non-reef fish)

Number responses	*Number of Meals/Year*	*Cumulative Frequency*	*Probit Value*
5	0	0.3846	4.7076
3	1	0.6154	5.2943
0	2	0.6154	5.2943
1	3	0.6923	5.5033
3	4	0.9231	6.4266
0	5	0.9231	6.4266
1	6	1.0000	6.9936

Number of meals is the sum of the mid-point of the responses

Addendum 1

Derivation of a Marine Finfish-Specific Fraction Ingested (FI_{MFF}) Term for Use in the REEFEX Human Health Risk Assessment

ADDENDUM 1

Derivation of a Marine Finfish-Specific Fraction Ingested (FI_{MFF}) Term For Use in the REEFEX Human Health Risk Assessment

(Addendum to: *Revised Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment, Based on Evaluation of Marine Angler Survey Data from the Ex-VERMILLION Reef, South Carolina*)

Prepared for
Navy Environmental Health Center
By
URS Corporation
September 5, 2003

INTRODUCTION

This document has been prepared in response to U.S. Environmental Protection Agency (EPA) comments, dated July 30, 2003, on an initial evaluation of a fish consumption survey conducted by the South Carolina Department of Natural Resources (SCDNR) in the spring of 2003[1,2]. One of the comments received indicated that use of the Fraction Ingested (FI) term which had been derived would suggest the use of an alternate Ingestion Rate (IR) value in the REEFEX human health risk assessment (HHRA), based on the fact that the denominator of the derived FI term was the amount of total fish eaten per year, including fish and shellfish from marine, estuarine, and freshwater sources[3]. The comment was:

> "…an IR_{fish} value of 4.7 g/day has been proposed [in the REEFEX HHRA]. This value is the average *marine finfish* ingestion rate for the South Atlantic Region (see EPA's Exposure Factors Handbook, Table 10-52)… Because the denominator of the calculation for the FI term was *all* fish and shellfish, the ingestion rate should also represent all finfish and shellfish. EPA's Exposure Factors Handbook provides an ingestion rate for all fish (i.e., marine and freshwater finfish and shellfish) of 20.1 g/day (see Table 10-7) for the U.S. population. There is no breakdown by region. In the absence of regional information, this may be an appropriate IR_{fish} term for this assessment."

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[1] EPA OPPT (Laura Casey). Email message dated July 30, 2003, Subj: "Fish Consumption Survey Comments".

[2] *Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina*, prepared for the Navy by URS Corporation, dated June 24, 2003.

[3] EPA OPPT (Laura Casey). Email message dated July 30, 2003, Attachment (2): VERSAR memorandum dated 29 July, 2003 from Linda Phillips, VERSAR, to Laura Casey, EPA OPPT, titled *Review of "Derivation of a Fraction Ingested Term for Use in the REFEX Risk Assessment…" prepared for the Navy by URS Corporation, June 24, 2003*".

The Navy Environmental Health Center (NEHC) appreciates the above EPA comment, and acknowledges that the derived FI term presented in the June 24, 2003 document is insufficient for the use for which it was originally intended, i.e., to be used in an assessment of risk to recreational marine anglers who might consume marine finfish caught from the ex-VERMILLION reef. The inadequacy is due to the lack of specificity of survey question IV.d. in which the respondents were asked to estimate how many "fish and shellfish meals" were consumed per year from sources such as restaurants, take-outs, or grocery stores. The question did not specifically ask how many *marine finfish* meals were estimated to have been consumed per year from these sources.

Since the exposure scenario assumed in the REEFEX HHRA is the ingestion of *marine finfish* caught on the ex-VERMILLION reef, the use of a FI term specific to marine anglers who fish the ex-VERMILLION reef, and an IR value which is specific for the consumption of marine finfish in the South Atlantic Region, are considered appropriate. Therefore, we have derived an alternative FI term, specific to ingestion of marine finfish (FI_{MFF}).

To derive this FI_{MFF} term, we based the numerator (the amount of marine finfish caught on the ex-VERMILLION reef and consumed by SC recreational marine anglers) on fish consumption survey data collected by SCDNR. We based the denominator (the amount of marine finfish consumed per year by SC marine anglers from all sources) on EPA published values.

The following steps are used to derive the FI_{MFF} term:

- The number of yearly ex-VERMILLION marine finfish meals consumed by SC marine anglers who fished the ex-VERMILLION reef (which value was derived from the SCDNR Fish Consumption Survey results[4]) is used.

- IR values from EPA Exposure Factors Handbook, Table 10-52 for the South Atlantic Region are retained.

- Mean and 95th percentile fish meal sizes for the general U.S. population (EPA Exposure Factors Handbook, Section 10.10.1, p. 10-26) are used.

- The total number of marine finfish meals per year is calculated by multiplying 365 days per year times the daily ingestion rate (g/day) for the South Atlantic region (Table 10-52), divided by average and upperbound meal sizes for the U.S. population (g/meal) (Section 10.10.1).

- The FI_{MFF} term is derived using the same deterministic and probabilistic methods employed in the initial FI term evaluation.

[4] See *Revised Derivation of a Fraction Ingested (FI) Term for Use in the REEFEX Risk Assessment, Based on Marine Angler Survey Data from the ex-VERMILLION Reef, South Carolina*, prepared for the Navy by URS Corporation, dated September 5, 2003 (to which this addendum document is attached).

ESTIMATION OF A MARINE FINFISH-SPECIFIC FRACTION-INGESTED TERM (FI_{MFF})

Use of Mid-Range FI Estimate

The EPA Guidance for Exposure Assessment (57 FR 22888) recommends against the use of high-end values for each exposure parameter used in a risk assessment because the compounding effect of multiple upperbound values would place the estimated exposure in the realm of Theoretical Upper-bound Exposure (TUBE). These guidelines recommend that while high-end exposure estimates should be greater than the 90th percentile of the total exposure, it should not be at the extreme upper end of the range. The Risk Assessment Guidance for Superfund[5] (RAGS) recommends using two to three exposure parameters that are high end, including the ingestion rate, and using central tendency values (mean values) for the remaining parameters when estimating Reasonable Maximum Exposure (RME). This approach has been incorporated into the REEFEX HHRA. Consistent with this approach, a central tendency FI_{MFF} term has been derived, that is based on the SCDNR fish consumption survey data for the number of meals of fish from the ex-VERMILLION reef, and the upperbound value for the total yearly number of marine finfish meals consumed.

Deterministic Estimate of Fraction Ingested Term for ex-VERMILLION Marine Finfish Consumption

The FI_{MFF} is derived deterministically by taking the ratio of the number of ex-VERMILLION reef fish meals consumed per year by (surveyed) marine anglers who fished this reef and the estimated total yearly number of marine finfish meals consumed in the South Atlantic Region.

To estimate the total number of marine finfish meals per year consumed by SC marine anglers, the mean and 95th percentile fish meal sizes, and the mean and 95th percentile marine finfish ingestion rates for the South Atlantic region, based on EPA[6], were employed. Given a daily marine finfish ingestion rate (e.g., 4.7g/day, mean value) and a mean fish meal size (e.g., 129g), a yearly marine finfish meal consumption value can be calculated as follows: 365 days, times 4.7g per day, divided by 129g per meal. This yields a mean value of 13.3 meals of marine finfish per year.

Using the 95th percentile values for marine finfish ingestion (15.9g/day) and meal size (326g per meal), a 95th percentile value for the number of marine finfish meals per year is calculated to be 17.8.

These values are used in calculating a central tendency point estimate for the ex-VERMILLION FI_{MFF} term in Table A-1. The FI term, based on the mean value for total

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[5] United States Environmental Protection Agency (EPA). 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A).* Office of Emergency and Remedial Response, Washington, DC.

[6] United States Environmental Protection Agency (EPA). 1997. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, DC, EPA/600/P-95/002F, August 1997.

yearly marine finfish consumption (13.3) and the mean number of ex-VERMILLION finfish meals from each individual survey, is 0.135. The 95th percentile for the total number of marine finfish meals per year (17.8) and the mean number of ex-VERMILLION finfish meals from each individual survey, yields a FI_{MFF} term for the ex-VERMILLION reef of 0.104.

Probabilistic Estimate of Fraction Ingested Term for ex-VERMILLION Marine Finfish Consumption

To describe and quantify the variability inherent within the deterministic FI_{MFF} term estimates, we employed the same probabilistic estimation method used in the initial FI evaluation – the bootstrap. The ex-VERMILLION marine finfish-specific FI term distributions, based on the mean and 95th percentile yearly marine finfish meals, are presented in Figure A-1. The top chart represents the bootstrapped FI_{MFF} term based on the number of ex-VERMILLION reef-associated fish meals per year, the number of marine finfish meals derived from the mean ingestion rate for marine finfish in the South Atlantic region (4.7g/day), and the mean fish meal size (129g). The lower chart is based on the upper limit (95th percentile) ingestion rate for marine finfish in the South Atlantic region (15.9g/day) and upper limit fish meal size (326g). The entire range of possible outcomes for the FI_{MFF} term, based on the mean and upper limit of the number of yearly marine finfish meals derived from the EPA Exposure Factors Handbook, is from 0.0572 to 0.2083.

The bootstrapped FI_{MFF} distribution, based on the mean yearly finfish meal, reveals a 50th percentile (most likely value) of 0.1389 (0.139). The 5th and the 95th percentiles of the bootstrap distribution (representing the 5% lower and 95% upper limits) are 0.070 and 0.208, respectively. In other words, there is only a 10% probability that the FI_{MFF} is either higher or lower than these values.

The 50th percentile (most likely outcome) of the bootstrap of the FI_{MFF} term, based on the upper limit for the number of yearly finfish meals, is 0.1055 (0.106). The 5th and the 95th percentiles of this distribution are 0.057 and 0.158, respectively. There is only a 10% probability that the FI_{MFF} is either higher or lower than these values.

SUMMARY OF FINDINGS

By calculating the FI_{MFF} term using deterministic and probabilistic methods, the potential range of values can be illustrated. The following summarizes the results of these calculations as presented above:

Based on Survey Results and Mean EPA Marine Finfish Ingestion Rate (for S. Atlantic) and Meal Size	
Point Estimate	0.135
Probabilistic Estimate Median	0.139
Probabilistic 5th Percentile	0.070
Probabilistic 95th Percentile	0.208
Based on Survey Results and 95th Percentile EPA Marine Finfish Ingestion Rate (for S. Atlantic) and Meal Size	
Point Estimate	0.104
Probabilistic Estimate Median	0.106
Probabilistic 5th Percentile	0.057
Probabilistic 95th Percentile	0.158

DISCUSSION AND RECOMMENDATIONS

This document was prepared in response to EPA comments, dated July 30, 2003, on an initial evaluation of a fish consumption survey conducted by SCDNR in the spring of 2003. Specifically, comments were received indicating that the initial evaluation document did not provide adequate Marine Finfish-specific justification for the derivation of a Fraction Ingested (FI) term of 0.1 for use in the REEFEX HHRA, given other exposure parameters (ingestion rates) that were being used. The purpose of this document is to derive a supportable FI term, specific to marine finfish consumption, for use in the risk assessment.

The FI terms discussed in this document were derived using survey data collected by SCDNR for the ex-VERMILLION reef, as well as from numerous published studies cited in the Exposure Factors Handbook (EPA, 1997). The deterministic central tendency estimates for the FI_{MFF} term range from 0.104 (based on the 95th percentile marine finfish consumption rate) to 0.135 (based on the mean marine finfish consumption rate). The probabilistic distributions present central tendency FI_{MFF} values in terms of the median (50th percentile) estimates. The median probabilistic FI_{MFF} term estimates range from 0.106 (based on the 95th percentile marine finfish ingestion rate) to 0.139 (based on the mean marine finfish ingestion rate).

The range in probable outcomes for the FI_{MFF} term derivation spans less than an order of magnitude, which suggests a "tight" statistical distribution and good agreement between the central tendency point estimate and the most probable outcome from the probabilistic analysis (50th percentile). The probabilistic estimation method is more statistically robust than a simple point estimate as it estimates the distribution of outcomes; as such, it provides the most probable FI_{MFF} term (50th percentile of the bootstrap analysis). The most probable FI_{MFF} term is 0.139 if the mean EPA marine finfish ingestion rate is used, and 0.106 if the 95th percentile EPA marine finfish ingestion rate is used. In other words, the central tendency FI_{MFF} may range from 0.104 to 0.139 based on our derivations. These values are comparable to and in the same order of magnitude to the FI value of 0.1 assumed in the REEFEX HHRA.

Our selection of a central tendency FI_{MFF} is consistent with the Guidance for Exposure Assessment (57 FR 22888) to avoid compounding of high-end values to derive the reasonable maximum exposure, and in accordance with the approved REEFEX HHRA work plan (high-end ingestion rate, exposure duration and frequency values were already used in the REEFEX HHRA).

It is important to recognize that there is, inherently, a degree of uncertainty associated with the EPA published studies, particularly as to how they relate to anglers at the ex-VERMILLION reef. However, this uncertainty would be present in any risk assessment that utilized published EPA values in application to a site-specific investigation. A degree of uncertainty is also associated with the estimates that were derived from the SCDNR Fish Consumption Survey data (e.g., the estimate for the number of marine finfish meals of ex-VERMILLION reef fish consumed by SC marine anglers), as these estimates take the survey data at face value and are as such only a fair representation of the survey data. The survey was limited in scope (occurred during one period of the year) and represents a small sampling (13 viable surveys).

While the above uncertainties are acknowledged, it is interesting to note that the derived FI values are all relatively similar, and tend to support the use of a FI term of 0.1. This value (0.1) is herein proposed as a supportable FI_{MFF} term for use in the REEFEX HHRA. This value is considered conservative/protective with respect to the risk assessment, particularly given additional information from the ex-VERMILLION fish consumption survey that indicates the majority of fish consumed from the vicinity of the reef are not resident reef fish, and are thus less likely to be impacted by shipboard PCBs. In summary, our derivations find that:

- The derived central tendency FI values for marine finfish consumption, from deterministic and probabilistic evaluations, are generally consistent with one another, and are within the same order of magnitude.

- Within the limitations of the survey sample size, and the EPA published values, the FI value of 0.1 assumed in the REEFEX HHRA is supportable by the deterministic and probabilistic (uncertainty) evaluations of an FI_{MFF} term.

The extrapolation of this FI_{MFF} term to other risk assessments of artificial reefs would need to be evaluated based on similarity, or dissimilarity, to the exposure scenario presented by the ex-VERMILLION reef.

TABLE A-1
DETERMINISTIC ESTIMATE OF THE FRACTION INGESTED TERM FOR EX-VERMILLION FISH BASED ON THE TOTAL NUMBER OF FINFISH MEALS PER YEAR

Survey Number	fraction ex-VERMILLION reef-associated fish caught	Mean Finfish Meals per Year [(4.7g/d * 365d/y)/129g/meal]	95th Percentile Finfish Meals per Year [(15.9g/d * 365d/y)/326g/meal]	mid-point ex-VERMILLION meals	fraction-ex-VERMILLION MEALS / Σ - meals (mean)	fraction-ex-VERMILLION MEALS / Σ - meals (95th percentile)	FI - ex-VERMILLION reef fish for only finfish (mean)	FI - ex-VERMILLION reef fish for only finfish (95th percentile)
1	100%	13.3	17.8	0	0 / 13.3	0 / 17.8	0	0
2	75%	13.3	17.8	4	4 / 13.3	4 / 17.8	0.226	0.169
3	100%	13.3	17.8	4	4 / 13.3	4 / 17.8	0.301	0.225
4	100%	13.3	17.8	6	6 / 13.3	6 / 17.8	0.451	0.337
5	100%	13.3	17.8	4	4 / 13.3	4 / 17.8	0.301	0.225
6	67%	13.3	17.8	1.5	1.5 / 13.3	1.5 / 17.8	0.076	0.056
7	67%	13.3	17.8	1.5	1.5 / 13.3	1.5 / 17.8	0.076	0.056
8	67%	13.3	17.8	1.5	1.5 / 13.3	1.5 / 17.8	0.076	0.056
9	0%	13.3	17.8	0	0 / 13.3	0 / 17.8	0	0
11	0%	13.3	17.8	20	20 / 13.3	20 / 17.8	0	0
12	0%	13.3	17.8	0	0 / 13.3	0 / 17.8	0	0
13	0%	13.3	17.8	4	4 / 13.3	4 / 17.8	0	0
14	100%	13.3	17.8	4	4 / 13.3	4 / 17.8	0.301	0.225

$$\frac{\sum meals}{year} = \frac{\left(365d \times \frac{4.7g}{d}\right)}{\frac{129g}{meal}} = \frac{13.3meals}{year}$$

$$\frac{\sum meals}{year} = \frac{\left(365d \times \frac{15.9g}{d}\right)}{\frac{326g}{meal}} = \frac{17.8meals}{year}$$

$$FI = \left[\frac{Midpt_{-\text{exVermillion fish meals per year}}}{\sum Meals_{year}}\right] \times f_{reef-fish}$$

Point Estimates of Fraction Ingested (FI) term for ex-VERMILLION reef fish

	Mean FI Term	95th Percentile FI Term
Mean	0.135	0.104
Upper 95% Confidence Limit for the Mean	0.224	0.174
Standard Error	0.041	0.0323
Median	0.100	0.0565
Mode	0	0
Standard Deviation	0.148	0.117
Sample Variance	0.022	0.0136
Kurtosis	1.870	-0.779
Skewness	1.403	0.77
Range	0.500	0.337
Minimum	0	0
Maximum	0.500	0.337
Sum	1.75	1.35
Count	13	13

Addendum 2

Methods Used in Conducting a Fish Consumption Survey of South Carolina

Addendum 2

METHODS USED IN CONDUCTING A FISH CONSUMPTION SURVEY OF SOUTH CAROLINA MARINE ANGLERS THAT FISHED THE ex-VERMILLION REEF IN 2001 OR 2002

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Andrea Lunsford, NEHC
Carl Crane, URS
19 August 2003

BACKGROUND

South Carolina is one of several coastal states interested in acquiring decommissioned U.S. Naval vessels for use in building artificial reefs. The anticipated benefits of building offshore reefs with former Naval vessels (REEFEX) include enhancing ecological resources by increasing the amount of productive hard-bottom habitat, using artificial reefs as marine protected and conservation areas, or using artificial reefs to provide alternative reefs for enhanced recreational fishing and diving opportunities so that natural hard-bottom reef communities can be better protected and conserved.[1]

Studies of decommissioned Naval vessels indicate that residual levels of polychlorinated biphenyls (PCBs) are likely to be present in some ship components. In order to address the feasibility of using these vessels in reef-building programs, an interagency REEFEX Technical Working Group (TWG) was established, consisting of representatives from the U.S. Environmental Protection Agency (EPA), the U.S. Navy (Navy), and the South Carolina Department of Natural Resources (SCDNR). Potential risks associated with PCB contamination was one of the critical issues to be addressed by the TWG; specifically, whether use of decommissioned Navy vessels for reef-building could pose potentially unacceptable risks. By participating in the TWG, SCDNR was able to provide the Navy and EPA with preliminary data on PCBs measured in fish and invertebrate tissues collected from several vessel artificial reefs off the coast of South Carolina,[2] and assist with the Navy risk assessment projects by collecting additional fish samples from an ex-Navy vessel artificial reef (the ex-Vermillion reef) and a reference, naturally occurring hard-bottom reef in South Carolina offshore waters.

To assess the potential risks to human heath, the Navy Environmental Health Center (NEHC) performed a Draft Baseline Human Health Risk Assessment (HHRA)[3], and

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[1] M. Bell, Marine artificial reefs. What is an Artificial Reef? South Carolina Department of Natural Resources, 2001. http://water.dnr.state.sc.us/marine/pub/seascience/artreef.html

[2] R.M. Martore, T.D. Mathews, and M. Bell, Levels of PCBs and heavy metals in biota found on ex-military ships used as artificial reefs, Marine Resources Division, South Carolina Marine Resources Center, South Carolina Department of Natural Resources, Charleston, SC, unpublished.

[3] U.S. Navy Environmental Health Center (NEHC). 2002. *A Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls (PCBs) from Sunken Vessels used as Artificial Reefs (Food Chain Scenario)*. *Draft*. July.

submitted it to members of the TWG for review. This risk assessment evaluated the potential risks associated with ingestion of fish by recreational marine anglers who might fish an ex-vessel artificial reef. In collaboration with SCDNR, fish were collected from a natural reef and a sunken Navy vessel, the ex-Vermillion, located off the coast of South Carolina. Fish tissues were analyzed for PCBs, and risks evaluated for marine recreational angler populations. Members of the TWG reviewed the risk assessment and provided comments, both at the TWG meeting and subsequently, in written comments.

One key assumption of the human health risk assessment was that only a fraction (10 percent) of the fish ingested by South Carolina marine angler populations originated from the ex-Vermillion reef. This assumption was supported by survey information[4] for marine angler populations over the entire state, which indicated that of the total number of days spent saltwater fishing, only 17.3% of all saltwater fishing was done on artificial reefs; and that of all days fishing on artificial reefs, only a fraction (3.7%) of those days were spent fishing the ex-Vermillion. However, the South Carolina survey from which these data were derived was intended to capture information regarding fish harvests; questions about fish consumption were not included in the survey.

Comments received from the EPA Office of Prevention, Pesticides, and Toxic Substances (OPPTS) and their subcontractor, VERSAR,[5] on the HHRA observed that the Fraction Ingested (FI) value used in the risk assessment had been based on market survey data that did not specifically address the amount of fish caught and consumed by anglers who fished the ex-Vermillion. It was noted that it would be helpful if fish consumption data from anglers who were known to have fished the ex-Vermillion reef could be obtained to enable derivation of an FI value with less uncertainty.

In order to obtain this additional information, NEHC and SCDNR collaboratively developed and conducted a fish consumption survey of South Carolina marine anglers who fished the ex-Vermillion reef in 2001 or 2002. The completed surveys were forwarded to NEHC for evaluation of the data. This document provides a description of the survey tool, and the methods used by SCDNR in conducting the angler surveys.

FISH CONSUMPTION SURVEY TOOL

The NEHC developed a Draft Fish Consumption Survey Form that was intended to be used to capture the data recommended by the EPA, i.e., fish consumption information for South Carolina recreational marine anglers who were known to have fished the ex-Vermillion artificial reef. Because the desired data were specific to anglers who had

[4] R.J. Rhodes, M. Bell, and D. Liao, Office of Fisheries Management, Division of Marine Resources, Wildlife and Marine Resources Department, Charleston, SC, *Survey of Recreational Fishing Use of South Carolina's Marine Artificial Reefs by Private Boat Anglers*, Final report to the U.S. Fish and Wildlife Service, Project No. F-50, March 1994.

[5] VERSAR. Memorandum dated October 8, 2002 from Linda Phillips, VERSAR, to Laura Casey, EPA OPPT, titled *Review of REEFEX HHRA*.

fished the ex-Vermillion reef, this was intended to be a targeted survey. The survey form was reviewed by the EPA[6] and by SCDNR before being used to conduct the survey.

The Fish Consumption Survey Form (see attached survey form) included questions to verify that the anglers being surveyed had fished the ex-Vermillion reef during the specified period (2001 or 2002). For respondents that answered in the affirmative, i.e., that they had indeed fished the ex-Vermillion, additional questions were included on the survey to determine:

(1) The types or methods of fishing conducted when fishing on or near the ex-Vermillion reef;
(2) The types (species) of fish caught; and
(3) The anglers' consumption of fish over the specified period (consumption of fish obtained from the ex-Vermillion reef and consumption of fish and shellfish from other sources).

METHODS USED IN CONDUCTING THE SURVEYS

SCDNR personnel conducted the surveys during May of 2003. Two approaches were used to identify South Carolina recreational marine angler populations that were considered likely to include anglers that may have fished the ex-Vermillion artificial reef: (1) a popular Sportfishing Club was visited during a scheduled club meeting;[7] and (2) a large public marina, used extensively by marine anglers, was visited on a weekend to conduct intercept surveys with the fishermen as they returned from fishing trips.[8]

To conduct the surveys, SCDNR interviewed anglers that had verbally indicated that they had fished the ex-Vermillion reef in 2001 or 2002 and recorded the responses. Each question on the Fish Consumption Survey form was asked, and the response given by the angler was recorded. The date of the survey interview, the initials of the SCDNR recorder, and the initials of the interviewed angler were recorded on the top right corner of the first sheet of the survey form.

Surveys Conducted on 7 May 2003: Results of Florence Sportfishing Club Meeting

On May 7th, Mr. Donald Hammond, SCDNR, attended the Florence Blue Water Fishing Club meeting in Florence, SC. Mr. Hammond believed that members of this club would likely have a high number of anglers who might fish the ex-Vermillion reef. Forty-two anglers were in attendance. Mr. Hammond gave a short introduction about the purpose of

[6] Laura Casey, EPA OPPT. Email message dated January 16, 2003; "REEFEX HHRA – Proposed Fish Consumption Survey".
[7] Don Hammond, SCDNR. Email message dated May 8, 2003; "Results of Florence Sportfishing Club Meeting".
[8] Don Hammond, SCDNR. Email message dated May 18, 2003; "Vermillion Reef Fish Consumption Survey".

the survey (that it was focused on the fish consumption patterns by anglers who fish on particular artificial reefs) and asked if any of the anglers present had fished the ex-Vermillion reef in 2001 or 2002. Eight (8) individuals out of the 42 anglers present indicated they had fished the Vermillion reef in 2001 or 2002. Mr. Hammond completed 8 survey interviews, of the anglers who indicated they had fished the ex-Vermillion reef.

Surveys Conducted on 17 May 2003: Results of Winyah Bay Marina Visit

On May 17th, Mr. Donald Hammond, SCDNR, visited the Georgetown Landing Marina located on Winyah Bay in Georgetown, SC. The Georgetown Landing Marina is a large public marina frequented by marine anglers on weekends. Mr. Hammond conducted intercept surveys with the fishermen as they returned from fishing trips.

On May 17th, there were a lot of fishermen (estimated at greater than 100) moving through the marina. Mr. Hammond spoke to 60 to 70 people, asking if they had fished the ex-Vermillion reef. Of the people with whom he spoke, only six (6) indicated they had fished on the ex-Vermillion reef in 2001 or 2002. Mr. Hammond completed 6 survey interviews of the anglers who indicated they had fished the ex-Vermillion reef.

Survey Effort Results

By visiting the Florence Blue Water Fishing Club and the Georgetown Landing Marina, SCDNR attempted to target fishermen who were most likely to fish the ex-Vermillion reef. From over 100 people contacted, SCDNR was able to identify fourteen (14) individuals who indicated that they had fished the ex-Vermillion reef in 2001 or 2002. By interviewing these 14 individuals, 14 fish consumption surveys were completed.

The 14 completed surveys were forwarded to NEHC for review and evaluation of the data.

Survey #_____
Date: _____
Initials of Surveyor/Questioner: _____
Initials of Survey Participant _____

[DRAFT] FISH CONSUMPTION SURVEY

FOR SPORTS FISHERMEN WHO FISHED THE VERMILLION REEF IN CALENDAR YEAR 2001 (or 2002)

I. Verification Questions

a. Did you sport-fish in South Carolina marine waters during 2001? ☐ YES ☐ NO

b. Did you sometimes fish on the Vermillion reef in 2001? ☐ YES ☐ NO

[If you answered YES to both questions above, please continue with the below questions. *If you answered NO to either of the above questions, please do not continue.*]

II. Types of Fishing Conducted

a. When you fished on the Vermillion reef, did you usually bottom fish, troll, or both?

☐ Usually only BOTTOM-fished

☐ Usually only TROLLED

☐ Usually we both BOTTOM-fished *and* TROLLED

☐ I really can't remember whether I bottom-fished, trolled, or did both while fishing the Vermillion.

III. Types of Fish Caught

a. When you bottom-fished at the Vermillion reef, what types of fish did you usually catch? ***(Please check off, from the list below, the types of fish you usually caught when you bottom-fished at the Vermillion.)***

☐ Black Sea Bass
☐ Grouper
☐ White Grunt
☐ Vermillion Snapper
☐ OTHER (***Please list other fish usually caught***):__
_____
_____

☐ I really can't remember what types of fish I caught when I bottom-fished at the Vermillion.

IV. Fish Consumption Questions

a. Do you ***usually keep*** the legal-sized, edible fish that you catch, ***to eat yourself (or for your family to eat)?***

☐ YES -- I usually keep the edible fish I catch, for me/my family to eat.

☐ NO -- I don't usually keep the edible fish I catch for myself/my family to eat.

(Example of No - Rather, for example, I usually give it away to others; catch fish just for the sport of it, and throw them back; etc.)

b. What ***proportion*** of the edible saltwater fish that you catch ***do you estimate you or your family eats***? (*Please check the box below that* ***best describes*** *the proportion of fish that you/your family eats of the edible fish that you catch yourself.*)

☐	ALMOST ALL	(I/my family eat ***almost all*** of the edible fish/***almost every*** edible fish that I catch.)
☐	MOST	(I/my family probably ***eats 1/2 to two-thirds*** of the edible fish I catch.)
☐	SOME	(I/my family probably **eats less than one-half** of all the edible fish I catch.)
☐	NOT MUCH	(I/my family probably **eats less than one-quarter** of all the edible fish I catch.) [Examples: some people only eat the biggest, or the most favorite type of fish, and give the rest away. Or they don't like cleaning or cooking fish themselves, etc.])

c. During the year, do you/your family typically eat ***any*** fish/shellfish meals at restaurants, or from take-outs, or from commercial sources such as grocery stores?

☐ YES

☐ NO

Survey #_____
Date: _____
Initials of Surveyor/Questioner: _____
Initials of Survey Participant _____

d. ***How many fish/shellfish meals /*** (how often) do you estimate you/your family ate ***at restaurants or take-outs, or bought from other sources*** during 2001?

☐	1 to 2	(About one or two meals a year)
☐	3 to 5	(About one meal every three or four months)
☐	5 to 7	(About once every two months)
☐	10 to 13	(About once a month)
☐	13 to 16	(More than once a month)
☐	16 to 24	(About two meals every month)

e. ***How many home-cooked fish meals /*** (how often) do you estimate you/your family ate during 2001?

☐	1 to 2	(About one or two meals a year)
☐	3 to 5	(About one meal every three or four months)
☐	5 to 7	(About once every two months)
☐	10 to 13	(About once a month)
☐	13 to 16	(More than once a month)
☐	16 to 24	(About two meals every month)

f. ***How many of the home-cooked fish meals*** that you/your family ate during 2001 do you estimate ***were made up of fish that you caught from the Vermillion reef?***

☐	1 to 2	(One or two meals a year)
☐	3 to 5	(About one meal every three or four months)
☐	5 to 7	(About one meal every two months)
☐	10 to 13	(About one meal a month)
☐	13 to 16	(More than one meal a month)
☐	16 to 24	(About two meals every month)

APPENDIX K

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON:
A Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls (PCBs) from Sunken Vessels Used as Artifical Reefs (Food Chain Scenario) – November 2003

COMMENT	RESPONSE
A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Laura Casey, EPA (OPPT/NPCD) dated February 17, 2004	
General Comments	
1. OPPT/OPPTS Total Toxicity Factor - This term appears throughout this document but no definition or discussion of what is and how it is used is included. In the body of the document, please refer to this term as a "Total Toxicity Factor" and include a definition/discussion of this term, where it came from and how it is used. In your discussion of the Total Toxicity Factor, please use OPPT, it is more appropriate than OPPTS.	The total toxicity factor refers to a slope factor that is designed to provide a health-protective evaluation of the combined cancer and non-cancer effects of PCBs. This was briefly discussed in section 5.3 (Toxicity Assessment). Text has been added to section 1 that also describes the total toxicity factor. OPPTS has been replaced throughout the document with OPPT.
2. Acronyms/Abbreviations - many acronyms/abbreviations appear throughout the document but do not appear in the general list at the beginning of the document. Missing acronyms/abbreviations are as follows: CTE, OPPT, TCCD, FI, FS, QA/QC, CRM, SRM, GC/MS, EPA, %RSD, RRF, OPR, %RPD, EDL, LOC, RRT, tMCBs and %R.	Missing acronyms and abbreviations have been added to the acronym list.
3. The term "PCB-contaminated" appears throughout the document, this term has a specific definition in §761.3 which does not apply to this situation - the materials in question are often times > 500 ppm. A more appropriate term may be "PCB containing components" or "PCB containing non-liquid materials" or something similar. **40 CFR 761.3** "**PCB-Contaminated** means a non-liquid material containing PCBs at concentrations ≥50 ppm but < 500 ppm; a liquid material containing PCBs at concentrations ≥50 ppm but < 500 ppm or where insufficient liquid material is available for analysis, a non-porous surface having a surface concentration ≥10 µg/100 cm^2 but < 100 µg/100 cm^2, measured by a standard wipe test as defined in Sec. 761.123."	The phrase "PCB-contaminated" has been replaced with "PCB-containing" throughout.
4. It is not likely that EPA can or will specify a definite amount of PCBs that can be left on board a ship or a definite amount that must be removed from a ship before sinking. Due to variability of PCBs and their concentrations in these materials, it is more likely there will be conditions or steps to meet prior to or after sinking.	Comment Acknowledged.
5. What is the status of the PRAM software? Will it be part of the final submission?	The PRAM software is currently under development (see also response to above comment).It will not be submitted as part of the application for a national permit but continue to be developed until completion later in 2004.
6. Preparation of the ex-VERMILLION for sinking - what exactly was done to the ex-VERMILLION prior to sinking? Is there any documentation? Were any of the known or suspected non-liquid PCB containing materials removed such as cabling, gaskets, paints and so on? The 1985 National Artificial Reef Plan gives little guidance or information with regards to PCBs.	The decontamination procedures used for the ex-VERMILLION are documented in Section 4.1.1, paragraph of *A Screening Level Ecorisk Assessment for Using Former Navy Vessels to Construct Artificial Reefs* (Johnston et al., July, 2003). As stated in this document, "the vessel was prepared to acceptable standards for artificial reef construction activity in the U.S. at that time (Stone, 1985). A letter application to the

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	Department of Transportation from SCDNR documented the procedures used to prepare the ship (SCDNR 1987, Appendix 3.d). All commonly encountered potential shipboard pollutants such as fuels, oils, solid or liquid chemicals, liquid PCBs (electrical transformers and switchboards) and floatable materials such as plastics or wood were removed and properly disposed of by the contractor. To facilitate use of the ship in 110 feet of water and minimize its risk as a possible hazard to navigation, the overall height of the vessel was reduced to no greater than 55 feet (17 m) above the keel. All structure above the O-1 level was removed. Large holes were cut in the sides of the ship and between watertight bulkheads. Removing or welding internal doors and hatches open further breached internal watertight integrity. After final inspection by U.S. Coast Guard Marine Safety Office Wilmington, the vessel was towed to its final destination and sunk by the use of explosive charges set by U.S. Navy Explosive Ordnance Disposal personnel (EOD Mobile Unit Six). The ex-VERMILLION sank quickly, and settled in an upright position on barren flat sand bottom 110 feet (33 m) deep, approximately 32 nautical miles southeast of the port of Georgetown, SC. When the ex-VERMILLION and other similar ships were prepared for sinking in the 1980's, SCDNR was not aware that solid materials containing PCBs were present onboard the vessel. Therefore, no effort was made to remove specific materials for this reason. When all materials above the O-1 level (superstructure) were removed, some materials that likely contained PCBs were also removed. No effort was made to remove gaskets, cable runs, or other solid materials that may have contained PCBs in other parts of the ship. In the case where hatches or watertight doors were removed, they were often just thrown inside the ship, unless they were deemed to be of value to the contractor, then they were retained for scrap (some gaskets were left behind, others were removed)."
7. Please include the survey forms for the fish survey as part of the appendix.	Example survey forms were included in Appendix J.
8. Please include a discussion about possible reasons/scenarios/explanations for the fish on the target reef (especially the White Grunt) having higher lipid and PCB content than the reference reef. Previous meetings discussed a less strenuous lifestyle, no signs of disease or illness in the fish from either reef. This may become an issue when relating the PCB leach rate to fish PCB concentrations.	It is believed that the artificial reef created by the sinking of the ex-VERMILLION creates a relatively concentrated non-mobile fishery. The surrounding area based on discussion with the SCDNR crew was described as sand flats with limited areas of shelter and habitat. Therefore, a fish associated with the ex-VERMILLION reef is not as likely to expend energy in pursuit of prey which conserves their fat reserve. The reference reef was more complex and diverse and therefore fish are more likely to expend greater effort pursuing food. This discussion has been added to Section 4.2.3. In addition, the higher relief and greater size of the artificial reef may provide more habitat for development of epibenthic biomass comprising different links in food chain than is present on the natural reef. It may be hypothesized that something related to feeding behavior, such as more concentrated food on the artificial reef, less energy consumed by the fish living at the artificial reef, and plenty of crevices and

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	compartments on the artificial reef to easily avoid predators could cause the observed differences. White Grunt feed lower on the food chain than Vermilion Snapper and Black Sea Bass so it is reasonable to suspect that White Grunt are feeding on prey that are in closer proximity to reef and spend more time on the reef than Vermilion Snapper and Black Sea Bass. The largest fish collected were White Grunts caught on the ex-VERMILLION and these were the fish with the highest levels of PCBs."
Specific Comments	
Background	
- 2.2, pg 2-1 - First sentence - "Part 761, Title 40 in the Code of Federal Regulations (40 CFR 761) was promulgated by the U.S. Environmental Protection Agency (EPA or agency) under the statutory authority of Section 6 of the Toxic Substance Control Act (TSCA) (15 USC 2601)."	Correction made.
- 2.4, pg 2-2 - The SINKEX project and data from the ex-AGERHOLM are mentioned as a resource. Not everyone reviewing this document/submission knows or will know what this reference is about. Please include a description of the SINKEX project and relevant data and how the data was used in the REEFEX project.	The SINKEX Project is a deep-water ship sinking project that is not directly comparable to the shallow-water REEFEX project. As such, reference to SINKEX has been removed.
- 2.4, pg 2-3 - last bullet - why was this underlined, none of the other references were underlined in this manner.	Underlining has been removed.
- 2.5, pg 2-3 - First 2 sentences - "The amount of PCB-contaminated bulk product materials that can be left on a vessel (cleanup level) in the reef-building program has not been determined. It is understood that the EPA will be responsible for evaluating available information and making recommendations on this issue." It is unlikely if not, impossible to specify how much PCBs may remain on board or must be removed from a vessel prior to sinking. A more likely scenario will be a series or set of conditions/steps that must be met prior to or after the sinking of a vessels. The presence and concentrations of PCB containing materials is so variable within a ship and between ships that making this sort of hard number decision virtually impossible.	Comment acknowledged.
Data Acquisition and Quality Assurance	
- 4.2, pg 4-2 - It may be helpful to include a copy of method 1668A as there are numerous references to this method through this document. It would be especially helpful when references are made to parts of the method such as tables so the reader can refer to them.	A copy of Method 1668A has been attached to Appendix D.

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A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Laura Casey, EPA (OPPT/NPCD) dated February 17, 2004	
- 4.2.3, pg 4-6 - It may be helpful to the reader to include a copy of method 680 used by AD Little as an appendix.	A copy of Method 680 has been attached to Appendix D.
Human Health Risk Assessment	
- 5.1.3, pg 5-3 - Equation - in the equation "_" appears but in the descriptions "x" instead of _ appears, should it be "_ = mean of the log transformed data set" instead of "x = mean of the log transformed data set"	Apparently the fonts used in the equation and in the text do not print correctly on all computers. The character "x" is now used in both the equation and in the text to represent the mean of the log transformed data set.
- 5.2.4, pg 5-9 - Fish ingestion rate for children (IR_C) - Is there an equation missing? "IRc was defined using the following equation:" - There is no equation included.	The equation has been added.
- 5.2.4, pg 5-10 - "However, it should be noted that these FI term values are specific to the ex-VERMILLION, which may need to be modified if future marine anglers also fish other sunken-vessel artificial reefs." - This is an important concept; please provide some more explanation and details on why the FI term values may need modification.	Comment noted. The sentence in question has been modified to note that these FI terms were based on site-specific information collected from angler surveys of individuals who fished at the ex-VERMILLION, and may not be representative of other ships.
- 5.4.6, pg 5-20 - "Another area of uncertainty is the FI term that represents the fraction of marine finfish intake that may potentially be contaminated with ~~PCB~~ (should be PCBs) from the artificial reef."	Correction made.
- 5.4.6, pg 5-22 - "1) The ship is mitigated (removal of PCB-containing materials) to the same degree or more compared to the target reef (ex-VERMILLION)" - It is still not clear exactly what PCB materials were removed from the ex-VERMILLION other than liquids possibly containing PCBs. Was any NLPCB materials (cables, gaskets, insulation, paint) removed? Even after reviewing the 1985 National Artificial Reef Plan (stone, 1985) it was not clear what may have been removed. In order for EPA to make informed decisions regarding this permit application, we must know what was done in terms of PCB remediation. Please include documentation.	Please see response to General Comment 6 above.
Tables	
- Table 1-1 - remove the references to OPPT or OPPTS Total Toxicity Factor, refer to previous comment regarding this terminology.	"OPPT" has been removed.
- Table 1-2 - remove the references to OPPT or OPPTS Total Toxicity Factor, refer to previous comment regarding this terminology.	"OPPT" has been removed.
- Table 4-4 - What time frame is the estimated age in? Years? Months?	The time is in years, this information has been added to the text.
- Table 4-5 - What time frame is the estimated age in? Years? Months?	The time is in years, this information has been added to the text.

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- Table 4-6 - COCs - there are no signatures or dates. These COCs do not appear to be originals, were these COCs reproduced for the report?	The forms shown in Table 4-6 are not the official chain-of-custody forms, rather, they are electronic outputs. As stated in Section 4.2.2, the purpose of Table 4-6 is to show sample IDs, types, and analysis requested on the chain-of-custody form
Appendix B – Site Characterization Report – Study Sites, ex-VERMILLION Artificial Reef	
- "The 460 foot-long (139m) ship was towed to Wilmington, North Carolina where it was cleaned, stripped and prepared for its new role as reef material by a private marine contractor and ship breaker." - Are there any records of what was removed from this vessel besides possible PCB containing liquids?	See response to General Comment 6 above.
- 'The vessel was prepared to acceptable standards at the time (Stone, 1985)..." and "All commonly encountered potential shipboard pollutants such fuels, oils, solid or liquid chemicals, liquid PCBs (electrical transformers and switchboards) and floatable materials such as plastics and wood were removed...". It was not clear from the 1985 document what requirements, if any there were for removing and disposing of NLPCBs. After reviewing the 1985 National Artificial Reef Plan, one would have to assume that no NLPCBs were removed from this ship, is this true? Can any PCB remediation work be verified? It would be helpful to have a more detailed description of what work took place on the ex-VERMILLION.	See response to General Comment 6 above.
Appendix D – Data Validation Report	
Appendix D-1	
- 3.1.5, pg 11 - It would be helpful to include a copy of Method 1668A as the report is referring to terminology and tables that appear in the Method but not in this report.	A copy of this method has been included as Appendix A to Appendix D-1.
- 3.2.2, pg 14 - Third bullet - "...a matrix spike ample..." should probably read "...a matrix spike sample..."	The typographical error has been corrected.
- 3.2.3, pg 15 - Please check the dates in the first and second paragraphs; the shipping date occurs **after** the receiving, extraction and analysis date.	The shipping date has been corrected to reflect shipping during 2000.
- 3.2.3, pg 15 - Please explain why the lab modified the drying step and why they did not believe the modification would affect the results.	The requested explanation has been provided in Section 3.2.3.
- Appendix A - Sample Reporting Forms - It would be helpful to include a quick reference table for Validation Qualifiers and the Qualifier Codes instead of having to go back into the report and dig them out.	The requested table has been provided at the beginning of the sample reporting forms appendix, which is now Appendix B of Appendix D-1.
Appendix D-2	
- 3.2.2, pg 13 - third bullet - "...a matrix spike ample..." should probably read "...a matrix spike sample..."	The typographical error has been corrected.

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A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Laura Casey, EPA (OPPT/NPCD) dated February 17, 2004	
- 3.2.3, pg 14 - Please explain why the lab modified the drying step and why they did not believe the modification would affect the results.	The requested explanation has been provided in Section 3.2.3.
- 3.2.5.1, 18 - C^{13} should be ^{13}C.	The suggested correction has been made.
- 3.2.8, pg 20 - Please explain why field duplicate samples were not analyzed.	The requested explanation has been provided in Section 3.2.8.
- Appendix A - Sample Report Forms - It would be helpful to include a quick reference table for Validation Qualifiers and the Qualifier Codes instead of having to go back into the report and dig them out.	The requested table has been provided at the beginning of Appendix A - Sample Reporting Forms.

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COMMENT	RESPONSE
A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Linda Phillips, Versar, Inc. dated February 17, 2004	
General Comments	
• Using the Exposure Point Concentrations (EPCs) provided in Table 5-3 of the HHRA, I calculated the cancer risks, non-cancer hazards, and total risks (using the slope factor of 4 $(mg/kg/day)^{-1}$ to account for carcinogenic and non-carcinogenic risk) for the 10 PCB homologue groups, 13 dioxin-like PCB congeners, and total PCBs in White Grunt, Vermilion Snapper, and Black Sea Bass collected from the target and reference reefs. With the exception of PCB congener 189 (average exposure scenario) in White Grunt (target reef), all of the calculated risks and hazards were the same as those reported in Tables 5-4 through 5-9, and Appendix Tables F1-A through F3-B of the HHRA. It appears that the incorrect average EPC was used in the HHRA for PCB congener 189 for White Grunt at the target reef. As show in Table F-2B, the EPC used was 1.74E-02 mg/kg. However, Table 5-1 of the HHRA shows an EPC of 174 pg/g or 1.74E-04 mg/kg. Table 5-3 of the HHRA reports an EPC of 1.74E-04 mg/kg, and an independent analysis of the raw data for these samples also indicates a mean concentration of 1.74E-04 mg/kg. Thus, the hazard and risk for average congener 189 exposures from ingestion of target White Grunt would be 2 orders of magnitude lower and the total cancer risk from the dioxin-like congeners would be 1.64E-06 instead of 1.96E-06. The total hazard index would be unchanged. The Excel spreadsheet used to verify these calculations is attached. While these corrections do not change the overall conclusions of the HHRA, they should be corrected in the final report.	Acknowledged the EPC for congener 189 for White Grunt was incorrectly entered in Table F-2B as 1.74E-2 mg/kg instead of 1.74E-4 mg/kg. This error has been corrected. The resulting total risk for dioxin-like congeners is now shown as 1.64E-6 instead of 1.96E-6 (rounded to 1 significant figure, the resulting risk remains as 2E-6).
• The number of fish of each species used as the basis for the EPCs is unclear. Page 4-4 states that 62 fish were collected from the reference reef and 58 fish were collected from the target reef, and Table 4-2 is referenced. However, Table 4-2 shows that only 51 fish were collected from the target reef. The raw data sheets in Appendix D appear to indicate that 51 fish were collected from the target reef, as indicated in Table 4-2. Table 4-2 also shows that 22 Black Sea Bass and 20 Vermilion Snapper were collected from the reference reef. However, Table 4-3 and the raw data sheets in Appendix D indicate the opposite (20 Black Sea Bass and 22 Vermilion Snapper). Page 5-2 of the HHRA indicates that 15 fish sample results from each species were used in the analysis. This is inconsistent with the numbers described above and in Table 4-2. Clarification of the data used is needed.	A review of the data indicates the following: - 62 fish were collected from the reference reef and 55 from the target reef (58 is a typo, and has been corrected) - Of the 55 samples from the target reef, only 51 were analyzed (20 WG, 20 VS, 11 BSB) - Exposure point concentrations were calculated using 20 samples each for Vermilion Snapper (target reef), White Grunt (target and reference reefs), and Black Sea Bass (reference reef). EPCs for the Vermilion Snapper reference reef were based on 22 samples, and Black Sea Bass target reef EPCs were based on 11 samples. Text and tables have been corrected.

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A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Linda Phillips, Versar, Inc. dated February 17, 2004	
• As indicated above, I assumed that the EPCs in Table 5-3 of the HHRA were correct and used them to verify the risks shown in the HHRA. It should be noted, however, that many of the average target reef concentrations in Table 5-3 are different from those reported in Table 5-1. For example, Table 5-1 shows • 13,347 pg/g for tetrachlorobiphenyls in target White Grunt, but Table 5-3 shows 2.88E-2 mg/kg or 28,880 pg/g. An explanation for these discrepancies should be provided or corrections should be made as necessary. Note again that the value for dioxin-like PCB congener 189 in target White Grunt appears to be incorrect and may be an error in units conversion.	Several of the values in Table 5-1 were input incorrectly. These values have been corrected. As noted previously, the incorrect value listed for congener 189 was indeed a conversion error, and has been corrected. These two tables were not used directly in any calculation worksheets, and as such, did not affect any risk calculations.
• I used the data from the raw data sheets in Appendix D in an attempt to verify the EPCs reported in Table 5-3 of the HHRA. While many of the mean concentrations I calculated were identical or very similar (may be rounding differences) to those reported in Table 5-3, others are quite different from those reported in Table 5-3. For example, for target reef White Grunt, I calculated a mean value of 1.44E-05 mg/kg, but the EPC shown in Table 5-3 and used in the risk assessment calculations was 6.43E-06 mg/kg (i.e., less than one-half the value I calculated from the raw data). An explanation of these discrepancies would be helpful. Note that my Excel spreadsheet is attached.	A review of the reviewer's spreadsheets, in conjunction with a review of the raw data presented in Appendix D of the report, resulted in identification of two discrepancies in the way the data were handled. 1) The EPCs in the HHRA were calculated using ½ the reporting limit as a surrogate value whenever a sample was identified with a "U" qualifier. In a few cases, non-detected samples did not include the "U" qualifier. See for example the results for Black Sea Bass for sample FS-19-SB-R located in Appendix D-2 on page 57 of 159. Conger 44 is listed as a non-detected chemical, but it is not flagged with a "U" qualifier. In contrast, congener 169 is listed as non-detect, and a "U" qualifier is present. If a sample was listed as non-detect, but no "U" qualifier was included, the full detection limit was inadvertently used as the surrogate value in our calculations. This resulted in a slight overestimation of the EPC (generally, the change was less than one percent), and had no appreciable impact on any of the risk calculations. 2) A review of the calculation cells in the reviewer's EXCEL spreadsheet identified an equation error when calculating the mean concentrations. Mean EPCs for several fish were calculated as the mean of the values of columns "A" through "T", when they should have been based on columns "B" through "U" (i.e., the equation was offset by one column). This resulted in the incorrectly calculated mean values. Once this discrepancy was corrected, the values in the HHRA closely matched the values in the reviewer's spreadsheet (with the exception of the surrogate values based on non-detects, as described above).

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• Page 5-10 states that for the probabilistic risk assessment, the range of values for FI (fraction of fish ingested) was 0.05 to 0.1 with a mean of 0.075. It further states that 0.1 was considered an upper bound. However, based on the survey data provided, 0.1 was an average value (i.e., based on the mean of survey respondents). Thus, the range used in the probabistic assessment may underestimate risk. This may account for the slightly lower average and 95 percentile risks observed using the probabilistic techniques vs. the deterministic method.	Comment acknowledged. The FI range used in this probabilistic risk assessment is not considered to result in a substantive variation in the risk estimate. The slightly lower risks estimated using the probabilistic techniques may or may not be the result of the variation in the FI term. Three statistical methods were used to evaluate the fish consumption data survey results and subsequently develop the FI term. The three methods included calculation of the arithmetic average (0.081), a probit regression analysis (0.0955), and a probabilistic approach using the bootstrap technique (0.0795). The evaluations fully support the use of 0.1 as an upper bound value. Please See Appendix J of the HHRA.
• The results reported in the HHRA indicate that no non-carcinogenic hazard indices exceed 1.0. Thus, non-carcinogenic effects from ingestion of PCBs in fish from the target reef are unlikely. The highest hazard index is for ingestion of White Grunt from the target reef. The hazard index for this species is 1.0 when the revised fraction of reef fish ingestion of 0.11 (11%) is used. Carcinogenic risks based on the total of the 10 PCB homologues were at or below 1E-06 for the average exposure scenario for ingestion of all 3 fish species, and at or below 1E-05 for the RME scenario (risks were below 1E-06 for ingestion of Vermilion Snapper, at 1E-06 for Black Sea Bass, and at 1E-05 for White Grunt). White Grunt from the target reef had the highest risks for both scenarios. Risks based on the total risk factor of 4 mg/kg/day-1 are twice as high. Based on the sum of the 13 dioxin-like congeners, cancer risks were at or below 2E-06 for the average exposure scenario and at or below 2E-05 for the RME scenario. It is interesting to note that the risks based on the dioxin-like PCB congeners are higher than those based on the PCB homologue groups. Again, White Grunt from the target reef posed the highest risk. These risks are within or below EPA's target risk range of 1E-04 to 1E-06. As indicated in my comments on earlier versions of this HHRA, these risks reflect those resulting from exposure to fish at the ex-VERMILLION (or a sunken ship with similar characteristics and PCB content) only. If additional PCB-laden ships are sunk within the vicinity of the ex-VERMILLION, these risks may increase for several reasons, including: PCB concentrations in fish may increase due to increased PCB loading, and the fraction of reef fish ingested might increase if fishermen obtain fish from more than one artificial reef. These factors may need to be considered if additional ships are to be sunk in proximity to existing artificial reefs. This is acknowledged in the HHRA, but will need careful consideration in determining "clean-up" levels.	Comment acknowledged.

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• I suggest using 2 significant figures to express cancer risks. Note that some of the cancer risks currently reported as 1E-06 are actually slightly above 1.0E-06 (e.g., 1.3E-06). Because only 1 significant figure is used, this cannot be seen.	The HHRA used the standard practice of reporting risks to one significant figure, as recommended in RAGS (exhibits 8-2 through 8-4). This practice was adopted, since it is widely acknowledged that reporting risks and hazards to more than one significant figure implies a degree of precision in the risk estimates that is unsupportable because of the inherent uncertainties associated with the exposure assumptions and toxicity values.
• The estimated mass of PCBs on the ex-AGERHOLM is given on page 2-1. Is there any estimate of the mass of PCBs on the ex-VERMILLION that could be used to judge whether the fish tissue concentrations observed near the ex-VERMILLION (and the associated risks, as depicted in the HHRA) are likely to be representative of other Navy vessels that may be used for artificial reefs?	The environmental preparations of ex-VERMILLION are documented in Section 4.1.1 of the SERA report. Because the sinking of ex-VERMILLION preceded the Navy's discovery that PCBs existed in some solid materials, no effort was made to remove specific solid PCB containing materials. In the case where hatches or watertight doors were removed, they were often just thrown inside the ship. Some removed gaskets were left behind. This strongly indicates that the ex-VERMILLION was prepared to a lesser extent than the current draft BMP document. For example, solid materials potentially containing PCBs that were loose and removed from their original installed locations apparently were left onboard ex-VERMILLION because they were not floatable items. In the draft BMP document, the loose items are to be removed under SINKEX preparation requirements and hence would be removed for reefing. Solid PCB containing materials that are in their original installed locations are intended to remain onboard for both SINKEX and future Navy ship reefing. Because procedures for removing PCB-containing materials from the ex-VERMILLION were not as rigorous as those that would be implemented in the future for vessels that might be used as artificial reefs, the ex-VERMILLION is not considered representative of vessels that may be sunk in the future, but rather represents a worst-case scenario. See also response to EPA General Comment # 6 for a more detailed discussion of decontamination procedures implemented on the ex-VERMILLION.
• Page 2-2 mentions data collected from the SINKEX study of the ex-AGERHOLM. Do these data include fish tissue data? If so, are the results comparable to those of the ex-VERMILLION? If comparisons between these 2 studies can be made, it may help to determine whether the ex-VERMILLION is representative of ships in the ex- AGERHOLM class	The SINKEX project was a deep-water ship sinking project that is not directly comparable to the shallow-water REEFEX project and data from the SINKEX study was not used in the HHRA. The sentence discussing the SINKEX project has been removed from the HHRA.

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COMMENT	RESPONSE
A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Linda Phillips, Versar, Inc. dated February 17, 2004	
• It is not clear at this time how EPA will make a determination of "the amount of PCB-contaminated bulk product materials that can be left on a vessel (clean-up level) in the reef building program", since the relationship between the risk observed in the HHRA and the mass of PCBs on the target reef (ex-VERMILLION) is not known.	Condition #1 requires that the ship be mitigated (removal of PCB-containing materials) to the same degree or more compared to the ex-VERMILLION. As discussed above, ex-VERMILLION was prepared to a lesser extent than the current draft BMP document. Condition #1 is satisfied by accomplishing mitigation in accordance with the EPA BMP document. The narrative objective for PCB section in the draft EPA BMP document provides that solid PCB containing materials may remain onboard, provided that a risk-based PCB disposal approval is obtained.
• In Section 3.2 and elsewhere, the results of the probabilistic carcinogenic risk assessment are referred to as "95th percentile (RME) and 50th percentile (average) confidence levels". Are these actually 95th and 50th percentiles of the risk distribution? I do not believe they are confidence levels (i.e., confidence limits of the mean). Likewise, they should not have the RME or average designation as these descriptors refer to the deterministic risk assessment scenarios. However, the 95th percentile of the risk distributions should be similar to the deterministic results of the RME scenario because the RME scenario is intended to represent the upper end of the risk distribution. The 50th percentile or mean of the risk distribution should be similar to the deterministic results for the average exposure scenario. Based on my review of the HHRA results, this appears to be the case.	The results of the probabilistic risk assessment do indeed represent the 95^{th} and 50^{th} percentiles of the risk distribution. Text has been changed throughout the document to reflect this correction.
• Has EPA accepted PRAM for use in facilitating review of applications for reef building activities as suggested on page 4-1? Has PRAM been formally reviewed for this purpose?	The development of PRAM is currently continuing , the EPA will be invited to participate in that process.
• The footnote on Page 4-3 indicates that the ex-VERMILLION was the largest sunken vessel among the ship classes evaluated in the preliminary study by Martore et al. (1998). How does the ex-VERMILLION's size compare to other Navy vessels that would be likely to be sunk under the REEFEX program?	The ex-VERMILLION is identified as an Amphibious Landing Ship, which is in the mid-range of classes being considered. For comparison purposes, Amphibious Landing Ships are about 3 times larger than Destroyers and Frigates, but less than half the size of Aircraft Carriers (the largest ship class).
• How were the results of field duplicate samples used in the calculation of EPCs (see page 4-4)?	Field duplicates were taken for QC purposes, and were not used for calculation of EPCs. Section 3.2.8 of Appendix D-1 discusses the use of Field Duplicates in the data review process.

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS ON:

A Human Health Risk Assessment for Potential Exposure to Polychlorinated Biphenyls (PCBs) from Sunken Vessels Used as Artifical Reefs (Food Chain Scenario) – November 2003

COMMENT	RESPONSE
A. RESPONSE TO COMMENTS on A Human Health Risk Assessment document from Ms. Linda Phillips, Versar, Inc. dated February 17, 2004	
• Were UTLs calculated for Black Sea Bass or just White Grunt and Vermilion Snapper? The 2nd paragraph of Section - 5.1.3 seems to indicate that UTLs were only calculated for White Grunt and Vermilion Snapper. However, this may be a misinterpretation on my part because comparisons between target reef concencentrations and reference reef UTLs are described in the last paragraph on page 5-3.	UTLs were calculated for Black Sea Bass, as well as for White Grunt and Vermilion Snapper. The third paragraph in Section 5.1.3 has been modified to clarify that UTLs were calculated for all three fish species (Black Sea Bass, White Grunt and Vermilion Snapper).
• Footnote 5 on page 5-5 lists classes or types of vessels that may contain PCBs. To which class of ships does the ex-Vermilion VERMILLION belong?	The ex-VERMILLION falls into the class of Amphibious Landing Craft. The footnote has been modified to note this.
• Section 5.4.6 on page 5-19 should specify that the results that are presented represent the RME risks from the deterministic assessment and the 95th percentile risks from the probabilistic distributions.	An additional sentence has been added to the first paragraph of Section 5.4.6 clarifying that risk estimates presented in that section are specific to the RME deterministic risk evaluation and the 95th percentile probabilistic distribution.
• On page 5-20, the second bullet states that "The RME risks and hazards calculated using the IRIS slope factor represent . . . ." This statement should be corrected because hazards were not calculated using IRIS slope factors. They were calculated using RfDs from IRIS.	The sentence has been modified to note that risks were calculated using slope factors and hazards calculated using reference doses.
• On page 5-21, the first bullet on toxicity assessment (1st paragraph) states that because of weathering of PCBs in the ocean, the use of the RfD for PCB 1248 may be "quite inaccurate". In which direction is this inaccuracy likely to occur? Is it likely that hazards would be higher or lower than those estimated here? In the second paragraph, something may be missing. The last sentence states that, "Therefore, the risks calculated for dioxin-like PCBs were tentative . . ." Because this paragraph contains no previous discussion of the uncertainties associated with dioxin-like PCB toxicity factors; it appears that such discussion may have been inadvertently omitted.	The statement that the use of the RfD for PCB 1248 may be "quite inaccurate" has been replaced with a statement that "While the use of the RfD for PCB 1254 may not reflect the actual mixture that is present, it should provide a conservative estimate of hazard, since it is the lower of the two EPA-published reference doses." (note: the text incorrectly stated the RfD for PCB 1248 instead of PCB 1254 was used in the HHRA; there is no RfD for PCB 1248). The sentence "Therefore, the risks calculated for dioxin-like PCBs were tentative . . ." was written in the context of the uncertainties associated with the use of toxicity values that have not undergone the formal review and approval process. The sentence has been modified to state that use of these values adds an additional degree of uncertainty to the conclusions.
• Several of the references cited in the text do not appear in the reference section (e.g., NEHC 2003e, Versar 2000, CRM 1974a, EPA 1999d, EPA 1988a). Other citations need clarification (e.g., NEHC July 2000 on page 4-1 should probably be NEHC 2000d). There are also some references in Section 6 that are not cited in the text.	The reference section has been updated to include the references in question; several references have been removed or modified to reflect the citations in the text. It should be noted that CRM 1974a refers to a CRM (certified reference material) code, not a document.